

OPERATION MANUAL

MINI-CRAWLER CRANE

MC405C-5

Serial No.E5001 and up

⚠WARNING

Unsafe use of this machine may cause serious injury or death.
Operators must read this manual before operating this machine. This
manual should be kept near the machine for reference and periodically
reviewed by all personnel who will come into contact with it.

MAEDA

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Chapter 1

INTRODUCTION

1.1 INTRODUCTION

Thank you for purchasing the Maeda Mini Crawler Crane model MC405C-5.

This manual is intended as a guide for the safe and effective use of this machine. This manual describes the procedures for proper operation and maintenance of the machine.

This manual is available in other languages. If a different language manual is necessary, contact your local Maeda distributor for availability.

Save this manual in a designated safe place for future reference. Should this manual be lost or damaged, contact Maeda or a Maeda sales service agency immediately to order a new manual. This manual should remain with this machine upon transfer of the machine to a new owner.

This manual contains information that was available at the time of print.

The contents of this manual, including maintenance specifications, tightening torques, pressure, measuring methods, adjustment values and illustrations, are subject to change upon refinement of the machine, without notice.

Machine maintenance procedures may be updated by Maeda at any time. Always obtain the latest information from Maeda or a Maeda sales service agency before performing maintenance on this machine.

Installation and operation of this machine must comply with all laws and regulations where operated.

Only personnel who have obtained a license stipulated by the laws and regulations from the place of use are qualified to operate this machine, establish the power connection of the power supply equipment, and inspect and repair the electric system.

DISCLAIMERS:

All information, illustrations and specifications in this manual are based on the latest information available at the time of publishing. The illustrations used in this manual are intended as representative reference views only. Moreover, because of our continuous product improvement policy, we may modify information, illustrations and/or specifications to explain and/or exemplify a product, service or maintenance improvement. We reserve the right to make any change at any time without notice.

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03/2025

⚠ WARNING

Improper operation of this machine can lead to serious injury or death.

Operators and maintenance personnel must always read this manual prior to operation or maintenance of this machine.

Keep this manual in a designated place so that all personnel that work on this machine can refer to it periodically.

- Do not operate this machine before carefully reading this manual.**
- Always keep this manual at hand so you can refer to it when necessary.**
- If this manual becomes lost or damaged, contact us or our sales service agency promptly to order a new one.**

- This manual should always accompany the machine if the machine is transferred to another owner. If the machine is resold to a third party without informing us in advance, the warranty will no longer be valid.
- The information contained in this manual is based on the data that was available at the time of its creation. The information in this manual, including maintenance standards, tightening torques, pressures, measuring methods, adjustment values, and illustrations, are subject to change without prior notice due to continuous machine improvement. Such changes may affect the machine maintenance procedure. Always obtain the latest information from Maeda or our sales service agency before carrying out maintenance on this machine.
- Additionally, the monitor display contents or the controls may change due to software modifications, for example. If the description in the manual differs from the actual display or behavior, please contact us or our sales and service agent.

For safety information, refer to “1.2 SAFETY DEFINITIONS.” and “Chapter 2 SAFETY.”

1.2 SAFETY DEFINITIONS

Maeda is concerned for your safety and the condition of your mini-crawler crane. Safety statements are one of the primary ways to call your attention to the potential hazards associated with Maeda mini-crawler cranes. Follow the precautions listed throughout the manual before operation, during operation and during periodic maintenance procedures for your safety, the safety of others and to protect the performance of your mini-crawler crane. Keep the labels from becoming dirty or torn and replace them if they are lost or damaged. Also, if a part needs to be replaced that has a label attached to it, make sure to order the new part and label at the same time.

This safety alert symbol appears with most safety statements. It means attention, become alert, your safety is involved! Please read and abide by the message that follows the safety alert symbol.

 DANGER	Indicates a hazardous situation which, if not avoided, will result in death or serious injury.
 WARNING	Indicates a hazardous situation which, if not avoided, could result in death or serious injury.
 CAUTION	Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

This manual also uses the following indications for precautions that must be adhered to and for other useful information:

IMPORTANT	Indicates a situation which can cause damage to the mini-crawler crane, personal property and/or the environment, or cause the equipment to operate improperly.
	This denotes useful information.

The operating procedures, inspection and maintenance procedures, and safety precautions described in this manual apply only when the machine is used for the specified tasks.

The precautions given in this manual and on this machine do not necessarily cover every safety issue.

When carrying out machine operations or inspection and maintenance procedures that are not described in this manual, you are responsible for taking the necessary safety precautions.

Regardless of the above, never attempt to perform work or operations that are prohibited in this manual.

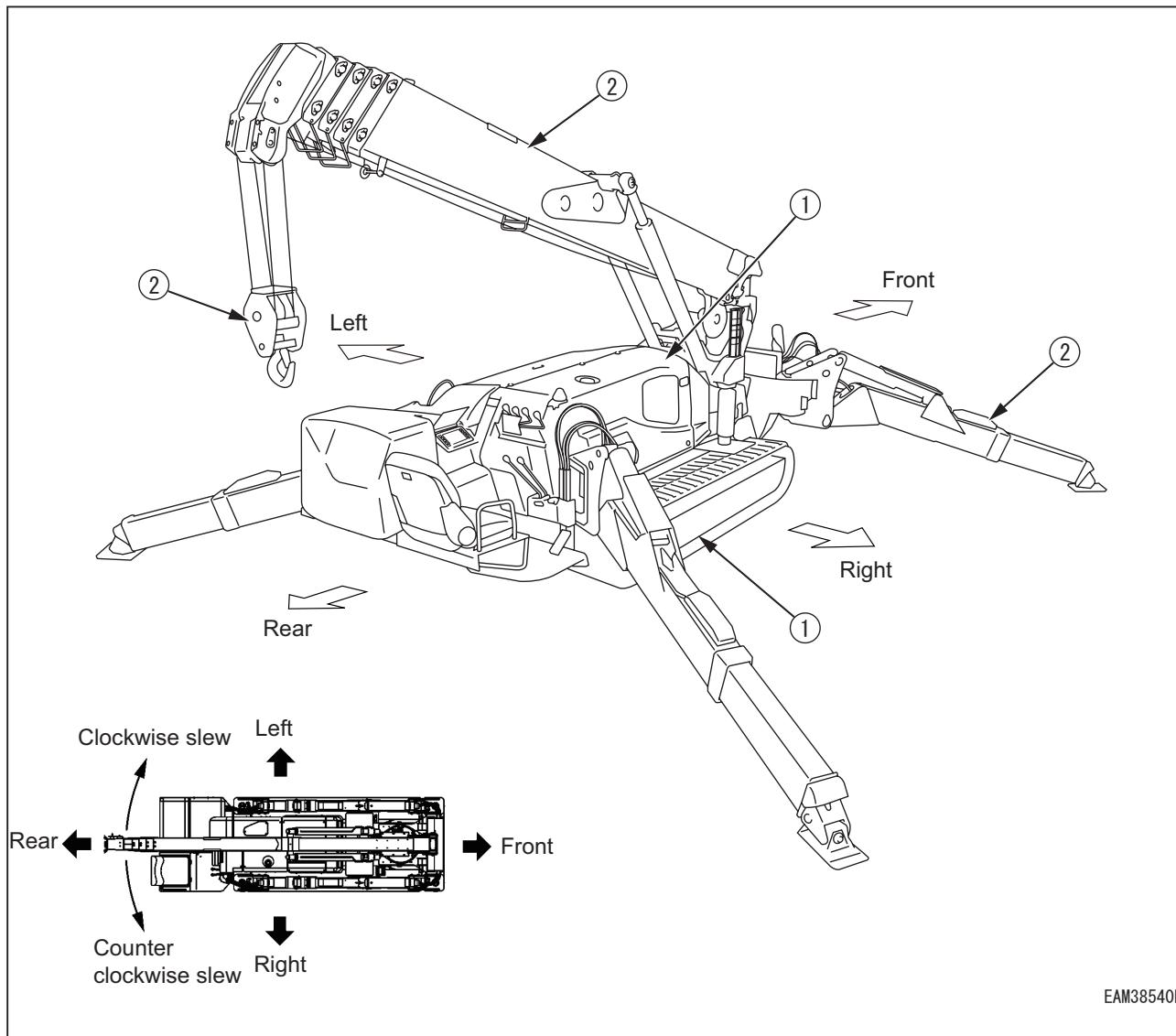
1.3 MACHINE INTRODUCTION

1.3.1 SPECIFIED OPERATIONS

This machine is only to be used for crane operation.

This machine is a mobile crane with a rubber track travelling dolly (carrier) mounted with a boom crane. This self-propelled crane is capable of moving (travelling) on a worksite and craning an object weighing within the rated total load capacity. This crane can be operated with a radio remote control system.

1.3.2 MACHINE CONFIGURATION



- (1) Carrier section
- (2) Crane section

Viewed from the travel lever, the front, back, left and right of the machine are illustrated in this manual from the front of the machine. Boom slewing motion is determined with the machine viewed from directly above; slew clockwise (right) denotes right-handed motion and slew counterclockwise (left) denotes left-handed motion.

This machine consists of the following main units.

[1] CARRIER SECTION

The carrier section is composed of a travelling gear, engine, travelling operation unit and crane operation unit.

[2] CRANE SECTION

The crane section is composed of a boom telescoping system, derrick system, slewing system, hook block, winch system and outrigger system.

[3] SAFETY DEVICE

The following safety devices are used on this machine:

- Overwinding detector / automatic stop device
- Over un-winding detector
- Hydraulic safety valve
- Hydraulic automatic locking device
- Latch
- Alarm buzzer
- Level gauge
- Crane tip-over alarm (an alarm issued in the event of crane operation at 3-degree inclination and travelling at 15-degree inclination)
- Travelling lever lock
- Travelling/crane/outrigger selector switch (designed to prevent the machine from craning at travelling)
- Outrigger safety device (outrigger interlock and crane interlock)
- Moment limiter (Working range limited)
- Working status lamp
- Outrigger un-set warning
- Inclination sensor
- Operator protection restriction

1.3.3 MACHINE FUNCTIONS

[1] CARRIER SECTION

- This machine is compact in design in order to keep the overall width between the crane and outrigger minimised while housed (in travelling posture). This compact design is ideal for work in confined areas.
- Two-travel lever operation enables direction changes forward, backward and right/left, and also pivot and spin turns

[2] CRANE SECTION

- It is equipped with auto-slide outriggers that enable outrigger extension and grounding operations to be performed from the operation seat.
- Through the combined use of telescoping, boom slewing and winch operation, the crane is capable of hoisting up or down the hook block and moving an object weighing within the rated total load capacity to a designated position within the confines of the working area.
- A remote control system allows remote crane operation.

1.4 QUALIFICATION FOR OPERATION

⚠ WARNING

- A high incidence of occupational accidents in crane operation has been reported.
- Be aware that experienced engineers are also no exception.
- Warnings and precautions defined in this manual shall be observed for safety assurance during operation of the machine.

1.4.1 QUALIFICATION FOR CRANE OPERATION

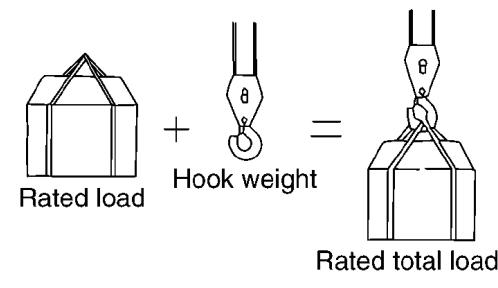
Only personnel that have obtained the required license or training stipulated by laws and regulations applicable to the place of use are qualified to operate this machine. Contact the relevant government office or our sales service agency for further information.

1.5 CRANE TERMINOLOGY

1.5.1 TERMS AND DEFINITIONS

[1] RATED TOTAL LOAD

The maximum load that can be applied according to the boom length and angle. The load includes the mass (weight) of hoisting accessories (hooks) and slinging ropes.

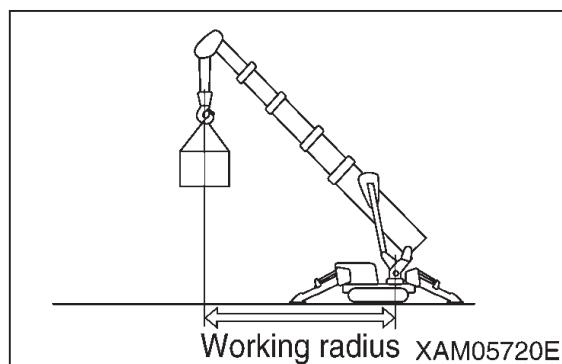


[2] RATED LOAD

A load derived by subtracting the mass (weight) of hoisting accessories (hooks) and slinging ropes from the rated total load, and can be hoisted.

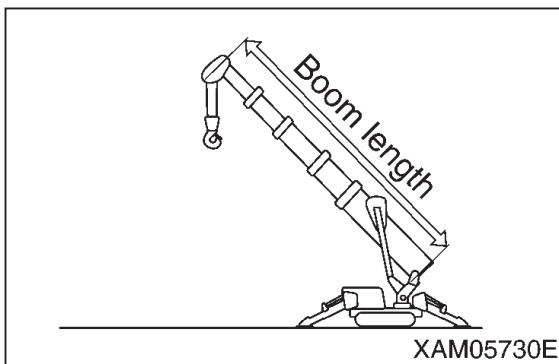
[3] WORKING RADIUS

A horizontal distance between the axis of slewing and the hook centre.

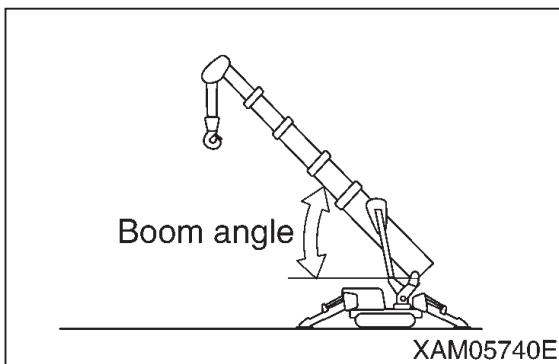


[4] BOOM LENGTH

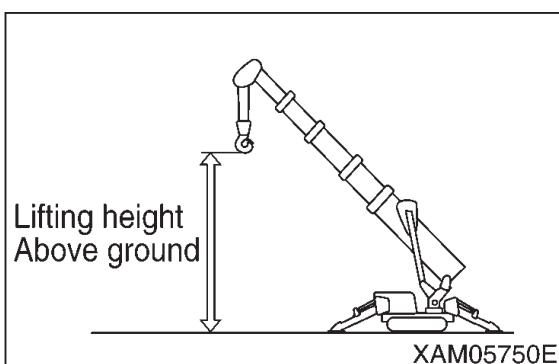
A distance between the boom primary pin and the sheave pin of the end boom.

**[5] BOOM ANGLE**

An angle which the boom forms with the horizon.

**[6] LIFTING HEIGHT ABOVE GROUND**

A vertical distance between the hook bottom and the ground with the hook hoisted up to the upper limit.



Chapter 2

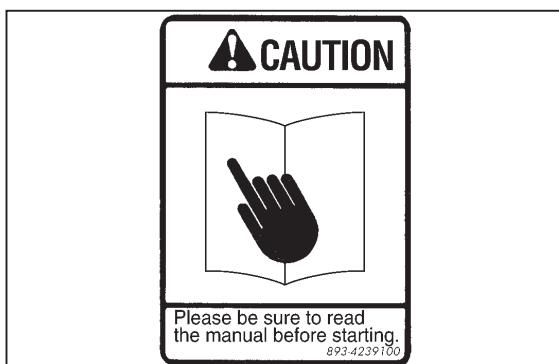
SAFETY

2.1 BASIC CAUTIONS

OBSERVE THE MANUAL AND SAFETY LABELS

- Read well and understand this manual as well as the safety labels attached to various parts of this Machine. Attempt to drive/operate without understanding fully may result in wrong operation that may cause personal or equipment accidents.
- Fully understand the proper use and inspection/maintenance procedures, and perform the work safely.
- Make sure this manual and the safety labels attached to various parts of this Machine are legible all the time.

Whenever illegibility or loss occurs, order us or our sales service agency and put the safety label back to the original location.



QUALIFICATION FOR OPERATION

Only personnel that have obtained the required license or training stipulated by laws and regulations applicable to the place of use are qualified to operate this machine.

Contact the relevant government office or our sales service agency for further information.

WEAR PROTECTIVE EQUIPMENT AND CLOTHES SUITABLE FOR WORK

- Always put on a helmet, safety shoes and safety belt.
- Make sure to wear the necessary protective equipment suitable for the relevant working condition.

- Do not wear loose garments or accessories as these may get caught on an operation lever or any protrusions which could lead to unexpected movement of the Machine.



COMMIT TO SAFE OPERATION

- Follow the instructions and signs given by the manager and work supervisor, and observe safety first during work.
- Follow the crane work basics during work.
- Always make sure to carry out inspections before using this machine.
- Do not work under bad weather for instance strong wind, thunder or mist.
- Do not drive under any condition when you are overtired, under the influence of alcohol or after taking soporific drugs.
- Follow all of the workplace rules, safety regulations and operation method sequences during operations and inspection/maintenance.
- Pay attention to surrounding conditions and pedestrians all the time during operation. Whenever pedestrian approaches unwarily, abort the operation once, and take a measure such as issuing a warning.
- When operating, be mentally prepared for unexpected situation so that you can take measures immediately.
- Never attempt any use out of the capabilities and purposes described in this manual under any circumstances.
- Observe the designated rated total load and work range when operating.
- Never attempt inattentive driving, harsh driving or awkward operation under any circumstances.

- Pull out the key when leaving the operator's seat.

USE OF MACHINE THAT WAS RENTED OR PREVIOUSLY USED BY SOMEONE ELSE

Check the following subjects in writing before using any Machine that was rented or previously used by someone else.

In addition, check the inspection record table for the maintenance conditions such as the periodic inspections.

- (1) Crane capacity
- (2) Crane maintenance conditions
- (3) Behaviors and disadvantages unique to the crane
- (4) Other subjects that require attention while operating
 - (a) Operating condition of the brakes, clutch and others
 - (b) Presence/absence and lighting condition check-up of lighting and rotating lamps
 - (c) Operating condition of hook, winch, boom and others

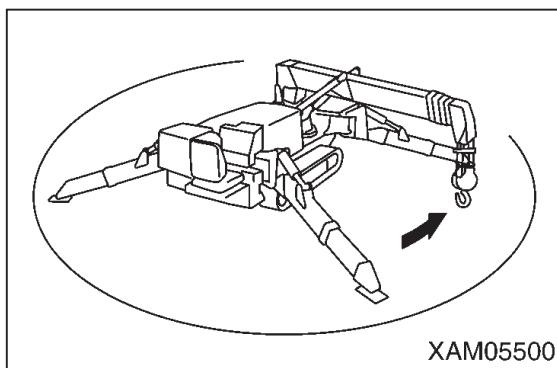
ENSURE SAFETY DEVICES ARE PROVIDED

- Check to ensure that all guards, covers, mirrors and rear-view camera are attached properly. Repair immediately if damaged.
- Understand how to use the safety devices well and use properly.
- Do not detach the safety devices under any circumstances. Keep control to achieve proper function all the time.
- Improper use of the safety devices may lead to serious accidents.
- Do not rely too much on the safety devices whilst operating.

FOLLOW THE INSTRUCTION AND SIGNS

- Follow the instructions and signs given by the manager and work supervisor, and ensure that safety takes priority while working.

- When working in a place that is likely to be a blind spot from the operator, operate the machine carefully following the instructions and signs given by the manager and work supervisor.
- Verify there are no people within the working radius of the crane and boom before operating the crane and boom. Sound the horn to signal operations are to begin. Be sure people do not enter the area inside working radius while the crane and boom are operating. Take into consideration that the working radius increases when a load is hoisted and the boom deflects.



PREPARE FOR ABNORMALITY

- Make sure to carry out inspections and maintenances, and make an effort to prevent accidents before happening.
- Whenever you feel an abnormality in the Machine, abort the operation immediately, ensure safety and report to the manager.
- Assign in advance who takes which solution to prevent secondary accident.

- Never operate the Machine when fuel or hydraulic oil is leaking from the Machine. Report the manager about the abnormality, and repair the leaking point of the fuel/hydraulic oil completely before use. The fuel for this Machine is diesel fuel. Be especially careful for the presence of fuel leak.
- Before leaving the Machine, lower the hoisted load to the ground, stop the engine and pull out the starter key.

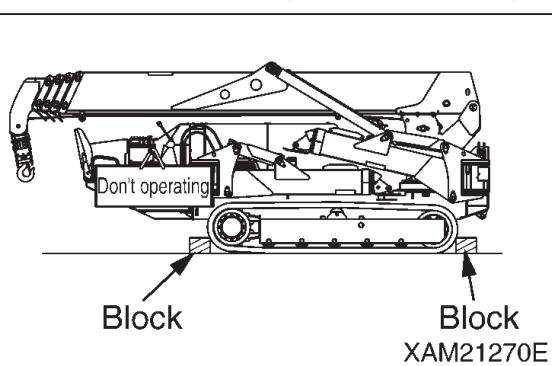


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TEMPORARY STORAGE WHEN A PROBLEM IS FOUND

If the machine is temporarily stored awaiting maintenance after a problem has been found, the following measures should be taken to notify all personnel that the machine is out of use due to a failure:

- Put on warning tags on the operation lever and other applicable parts. Write clearly the information such as abnormality contents, name and contact of the storage manager, and the term of storage.
- Make sure the machine cannot be moved (e.g., by placing chocks in the crawler tracks).
- Remove the starter key and keep it with you.

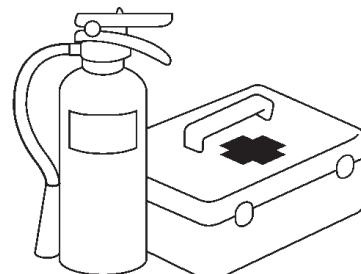


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PROVISION OF FIRE EXTINGUISHER AND FIRST-AID BOX

Always observe the following to prepare for injuries and fires.

- To prepare for the possibility of fire, decide on a location and install a fire extinguisher. Be sure to read the usage instructions on the label attached to enable action to be taken in the case of an emergency.
- Decide on the location for a first-aid box. Also make sure that the first-aid box is inspected periodically and replenished as necessary.
- Decide on the procedures for dealing with injuries and fires.
- Decide on the procedures for reaching emergency contacts (such as an emergency doctor, ambulance, and fire department), and display these contacts in the designated position, where everyone can access them.

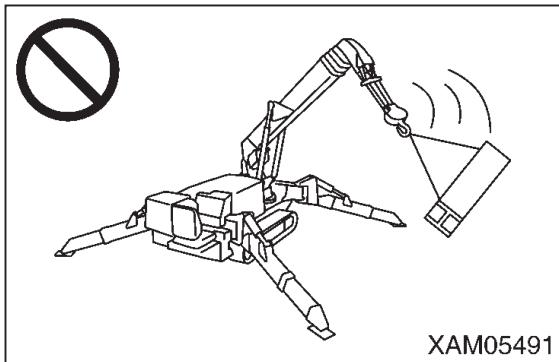


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CAUTIONS WHEN OPERATING CRANE

- Do not operate the levers suddenly.
- When two or more machines are working in close proximity, carefully operate the machine not to fall over due to contact with each other. In addition, please assign a guide as necessary to prevent contact accidents.
- Do not operate the machine if an abnormal condition occurs. Stop the operation immediately and correct the problem. Contact us or our sales service agency to request inspection and repair service.

- When visibility is poor because of bad weather (rain, fog, snow, etc.), stop the operation and wait until the weather improves.



MACHINE MODIFICATION IS PROHIBITED

Never attempt to modify the machine without our written consent. In particular, welding the machine may damage the safety devices. Modifications may create safety issues. Consult us or our sales service agency before attempting to make modifications. Maeda can accept no liability for any personal injury or failure caused by modifications to the machine that were performed without consulting us.

REFUELING HAZARD

- This machine is equipped with a diesel engine. Do not refuel other type of fuel. It may damage the engine.
- Always stop the engine before refuelling. Refuelling while the engine is running may cause leaked fuel to be ignited by hot parts such as the exhaust pipe.



A0055020

- Overfilling with fuel will cause fuel to spill and is therefore dangerous. Do not fill above the specified upper limit level. Always wipe away any fuel spills.
- Securely close the tank cap after refuelling.

PREVENTING FIRE

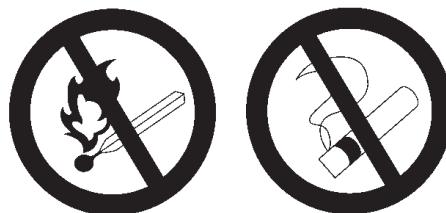
Fire caused by fuel, oil, anti-freezing fluid, or wind-washer liquid

There is a risk of ignition if open flames are brought near the fuel, oil, anti-freeze fluid, or window-washer liquid. The following points must be strictly adhered to:



A0055020

- Do not smoke or use open flames near the machine.



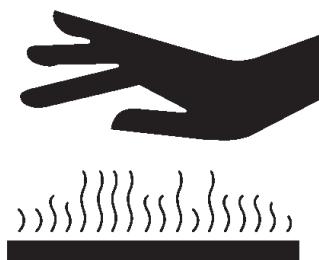
A0055040

- Close and securely tighten the fuel tank and hydraulic oil tank caps.
- Store fuel and oil in a designated well-ventilated location and prevent unauthorized access.
- Oily rags and any other combustible materials must be placed in a safe container and stored in a safe place.
- Do not leave the area when refuelling or replenishing the oil.
- After refuelling, wipe away any spilled fuel or oil.

BURN HAZARD

Do not open the radiator cap under normal circumstances while the engine is hot. Inspect the cooling water in the sub tank after the engine has cooled.

The cooling water will be hot after the engine has stopped. Similarly, pressure will still be built up inside the radiator. If the cap is opened in this state, the cooling water may blow out, resulting in burn injuries. When removing the radiator cap, allow the cooling water to cool down, then turn the cap slowly to release the pressure before carefully removing it.



A0055050

When checking or discharging oil, ensure that the cap and plug have cooled down so that they can be touched with bare hands, thus preventing burn injuries from hot oil spurting out or contact with hot parts. When removing the cap and plug, first loosen it slowly to relieve the internal pressure.

ASBESTOS DUST HAZARD

Inhalation of asbestos dust carries the risk of lung cancer. This machine does not contain asbestos, but asbestos may be found in the walls or ceilings at the site where the machine is being used. Also be careful of the following points when working with materials that may contain asbestos:

- Wear designated dust protection masks where necessary.
- Do not use compressed air for cleaning.
- Spray water when cleaning to prevent asbestos dust from becoming airborne.
- Always work upwind when operating the machine at a site where asbestos dust may be present.

- Keep unauthorized personnel away from the worksite.
- Strictly observe the specified rules relating to worksite and environmental standards.



A0055060

PRECAUTIONS AGAINST BECOMING TRAPPED

The gaps around the upper slewing body and crane unit vary depending on the movement of the derrick cylinder and winch. If the operator is caught in the machinery, serious personal injury may result.

Keep persons away from all rotating and telescoping sections.

In particular, keep your body away from any of the following gaps:

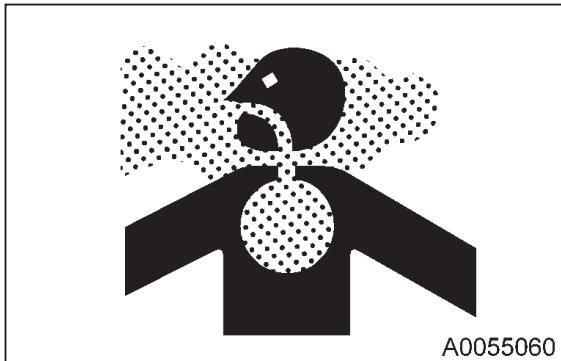
- Between the boom and the upper slewing body
- Between the ground and the saucer of the outrigger
- Between the boom, the post and derrick cylinder
- Between the winch drum and the wire rope
- Between each sheave and wire rope
- Between the ground and the crawler



A0055130

EXHAUST HAZARD

When starting the engine or handling fuel, cleaning oil, or paint indoors or in a poorly ventilated location, open the windows and doors to prevent the risk of gas poisoning. If the ventilation is insufficient even after opening the windows and doors, install an extractor fan.



2.2 SAFETY LABEL LOCATIONS

Keep safety labels clean and visible at all times.

If lost, replace immediately or apply for a new one.

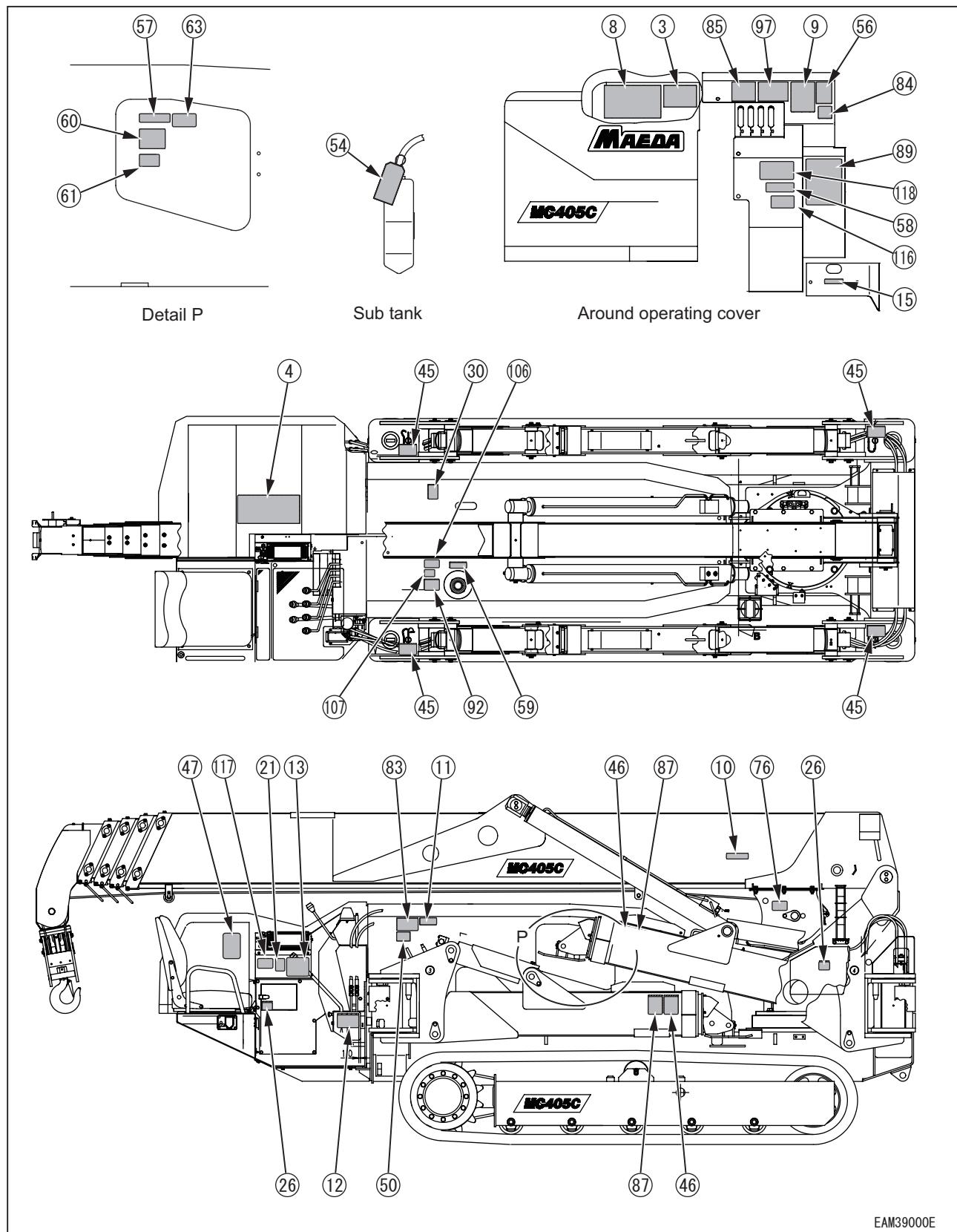
There are other labels than safety labels shown below and treat them in the same manner.

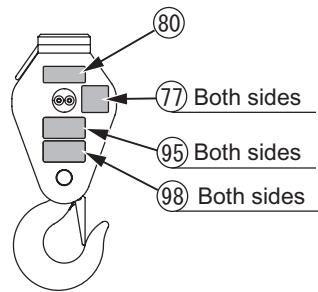
[Signal words]

The following artwork may be used to explain the meaning of the different signal words as defined in this standard

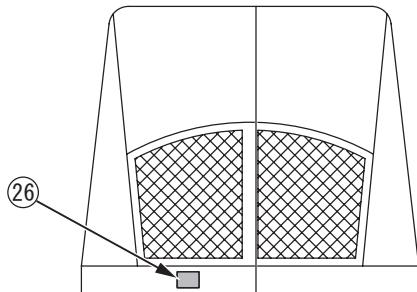
DANGER	DANGER indicates a hazardous situation that, if not avoided, will result in death or serious injury
WARNING	WARNING indicates a hazardous situation that, if not avoided, could result in death or serious injury
CAUTION	CAUTION indicates a hazardous situation that, if not avoided, could result in minor or moderate injury
NOTICE	NOTICE is used to address practices not related to physical injury
SAFETY INSTRUCTION	Safety Instruction (or equivalent) signs indicate specific safety-related instructions or procedures

2.2.1 MACHINE BODY

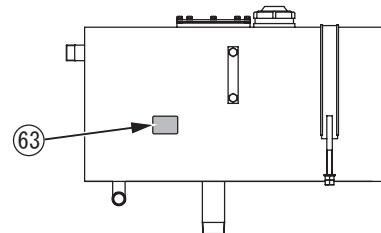




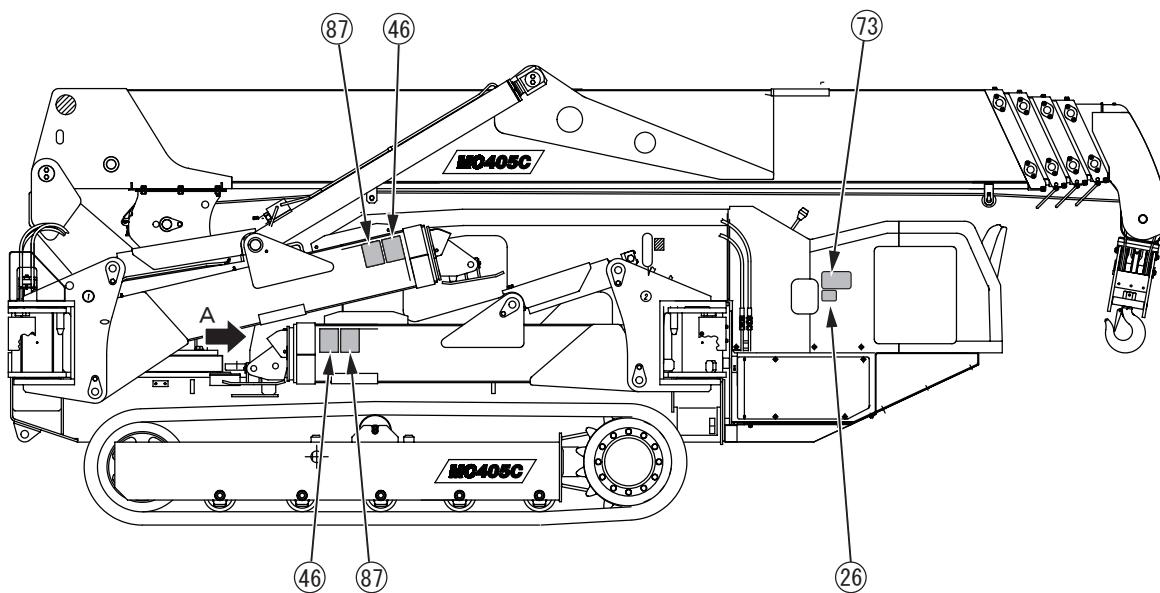
Hook block



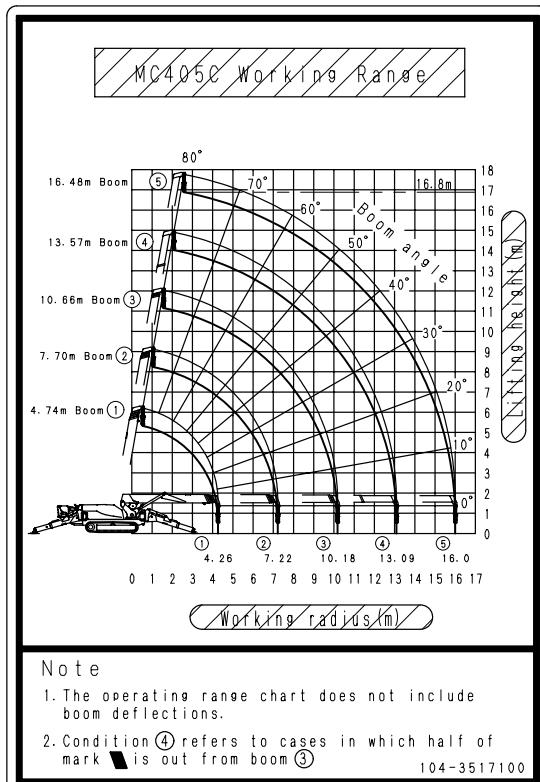
View A



Hydraulic oil tank

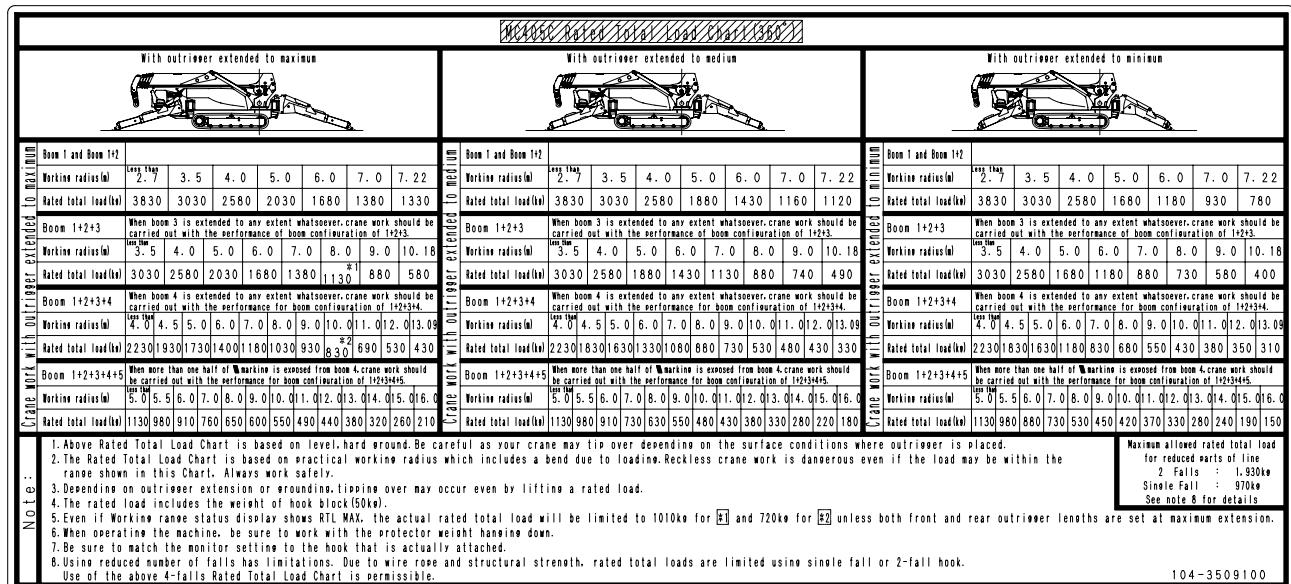


EAM39010E

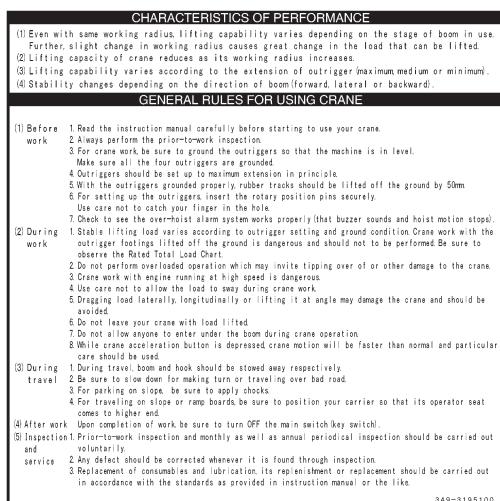
**Note**

1. The operating range chart does not include boom deflections.
2. Condition ④ refers to cases in which half of mark is out from boom ③

[3] 104-3517100



[4] 104-3509100



[8] 349-3195100

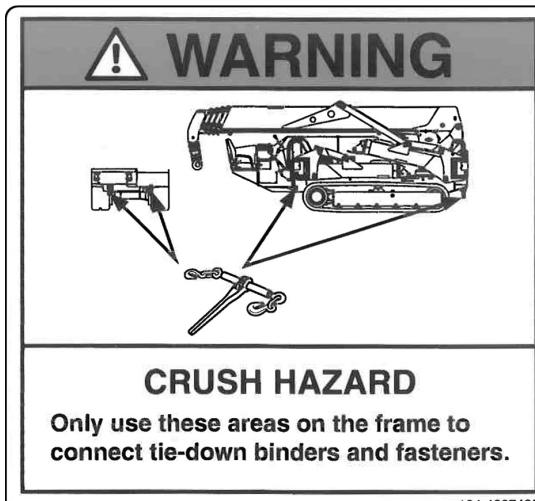
MC405C	
MACHINE WEIGHT	
Component	Weight
Main Unit	5 640 kg
Electric Unit	+ 150 kg
850 kg Searcher Hook	+ 30 kg
Fly-Jib	+ 150 kg

104-4896900

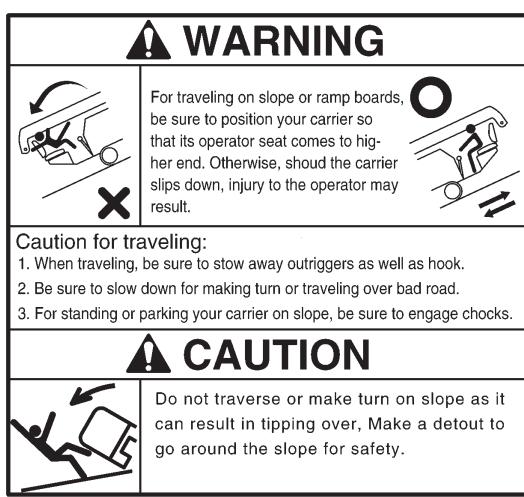
[11] 104-4896900



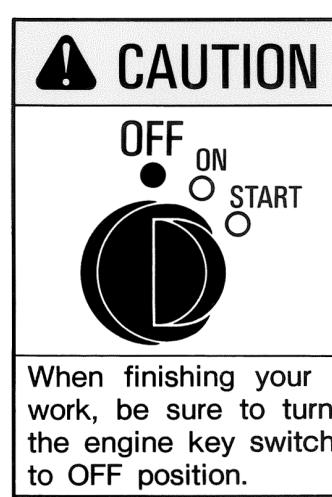
[9] 103-4591100



[12] 104-4607400



[13] 349-4421100



[21] 349-4421400



[26] 350-4539700 (4 places)



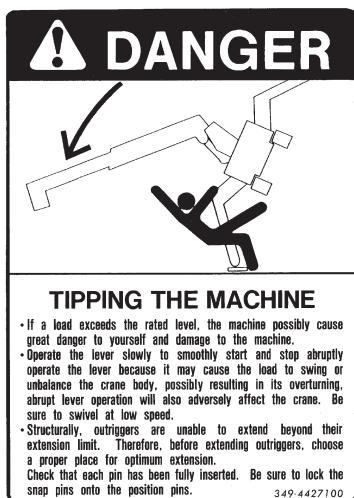
[45] 103-4589600 (4 places)



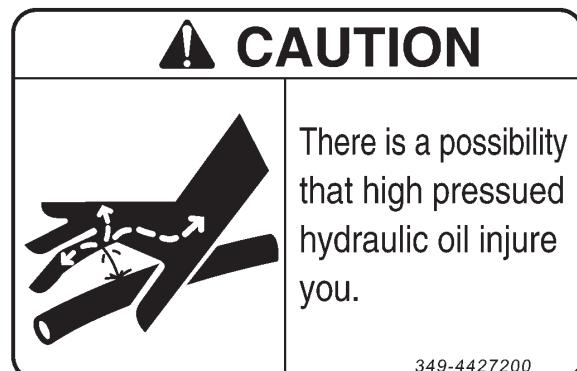
[30] 104-4550800



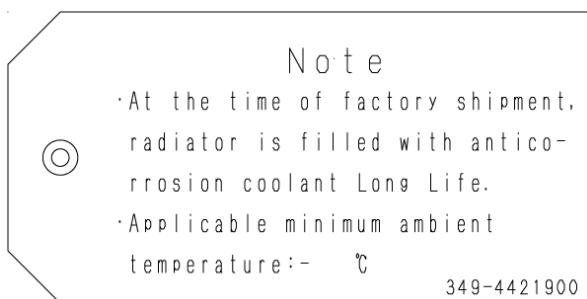
[46] 103-4589500 (4 places)



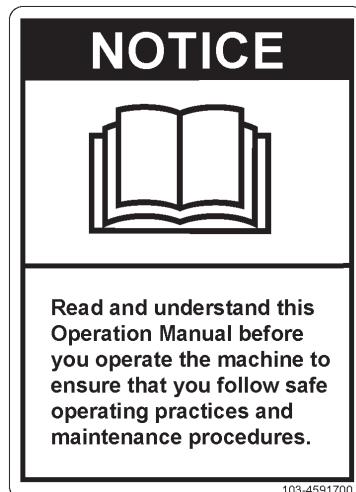
[47] 349-4427100



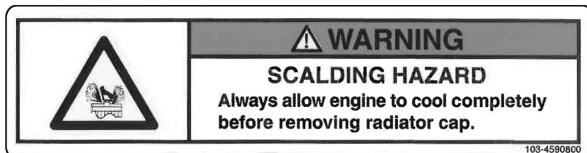
[50] 349-4427200



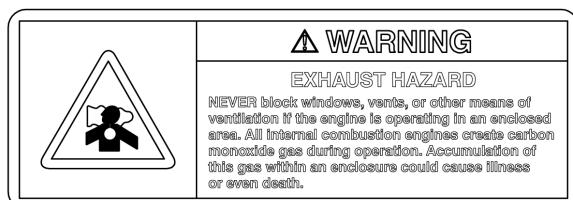
[54] 349-4421900



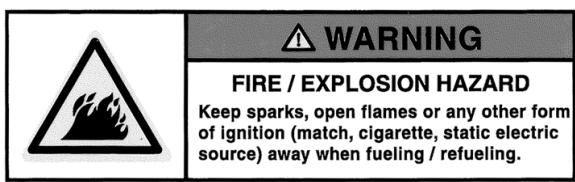
[56] 103-4591700



[57] 103-4590800



[58] 102-4792900



[59] 103-4590900



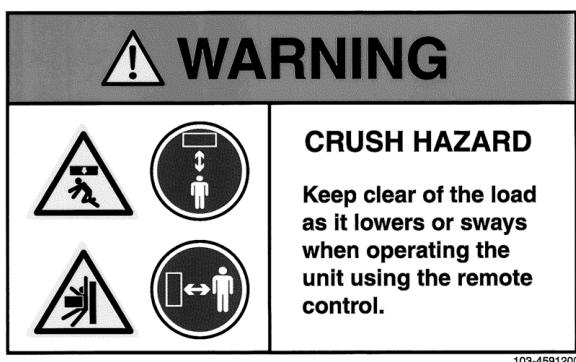
[60] 103-4590500



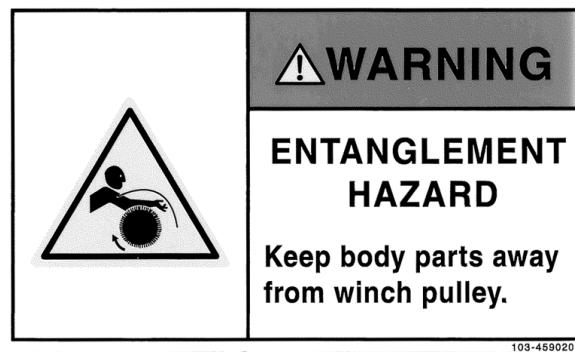
[61] 106-4855300



[63] 106-4855400



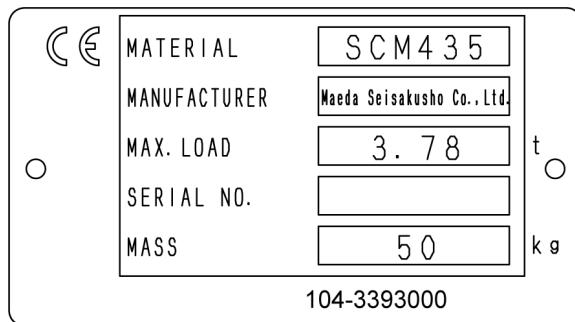
[73] 103-4591200



[76] 103-4590200 (2 places)

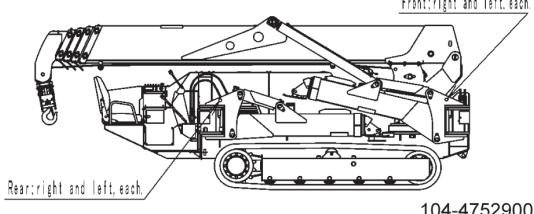


[77] 103-4592400 (2 places)



[80] 104-3393000

Positions to hang whole unit with four wire ropes.



[83] 104-4752900



When counter-rotating tracks set engine speed to idle and turn off high-speed travel selector switch.

349-4536600



DANGER



When the machine inclines in excess of 3 degrees during crane work, or in excess of 15 degrees during travel, the tipping alarm buzzer will sound. For preventing it from tipping over, return it to the state for the buzzer not to sound at once, and start the work or traveling.

353-4488600

[85] 353-4488600

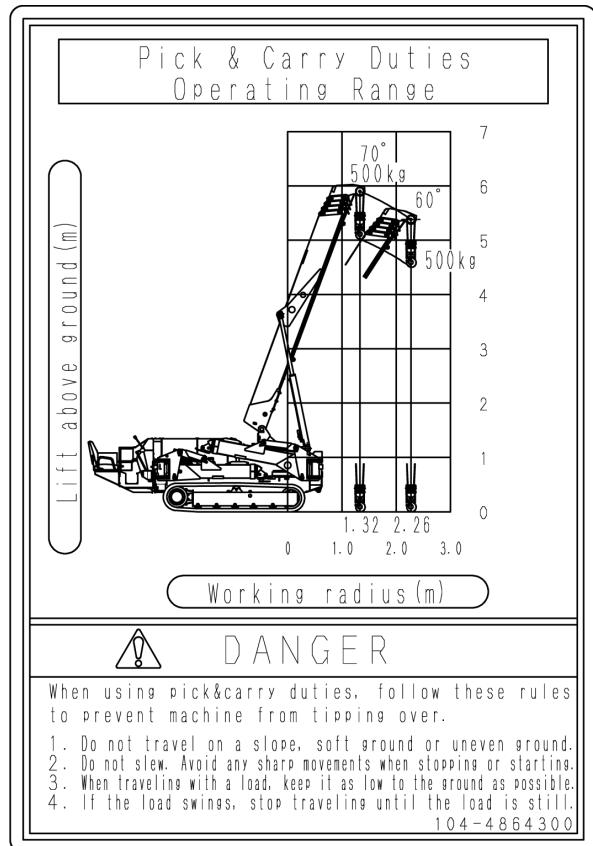


CRUSH HAZARD

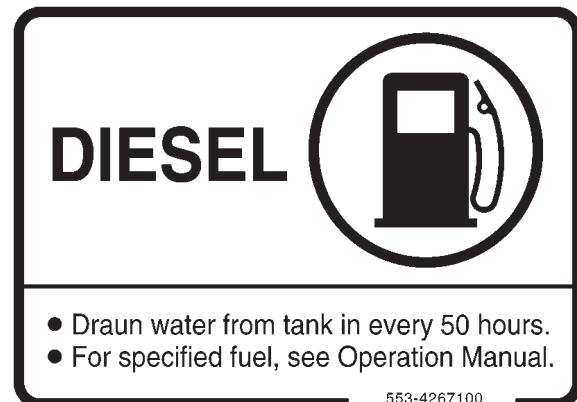
When the machine is not level, be careful not to get trapped between the machine and the Outriggers. If not level the Outriggers may swing unless held still.

106-4855500

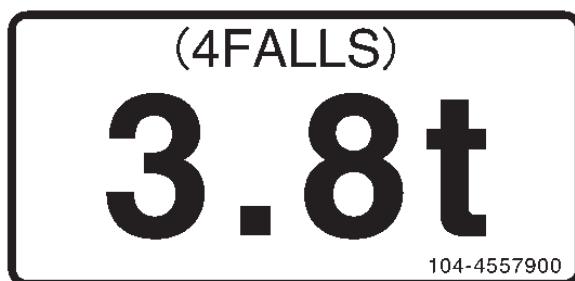
[87] 106-4855500 (4 places)



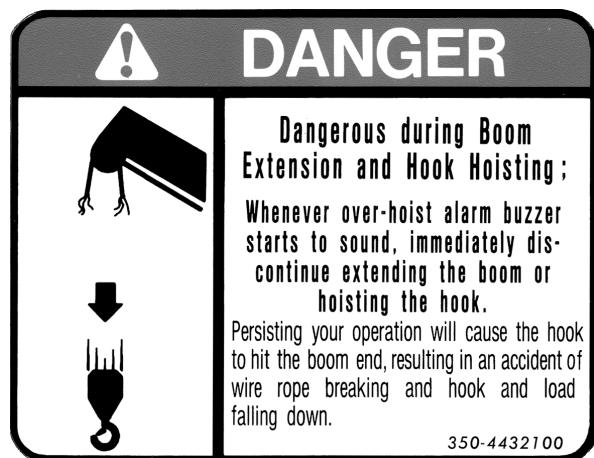
[89] 104-4864300



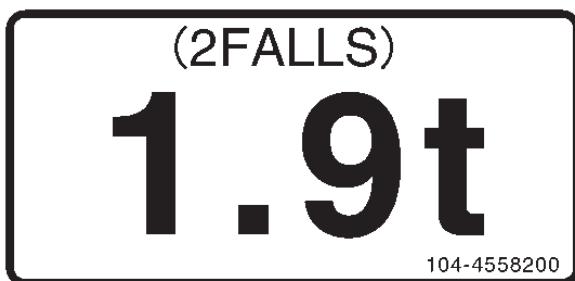
[92] 553-4267100



[95] 104-4557900 (2 places)



[97] 100-4792800



[98] 104-4558200 (2 places)

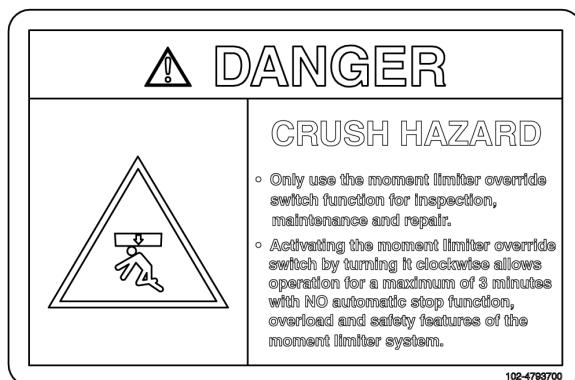
⚠ WARNING

To prepare for fires, decide the fire extinguisher storage location and install one, fully read the attached label for the usage and be prepared for fighting against the emergencies.

103-4604800



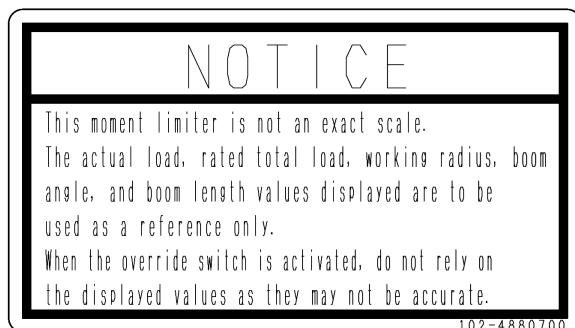
[107] 103-4604900



[115] 102-4793700



[116] 106-4860200

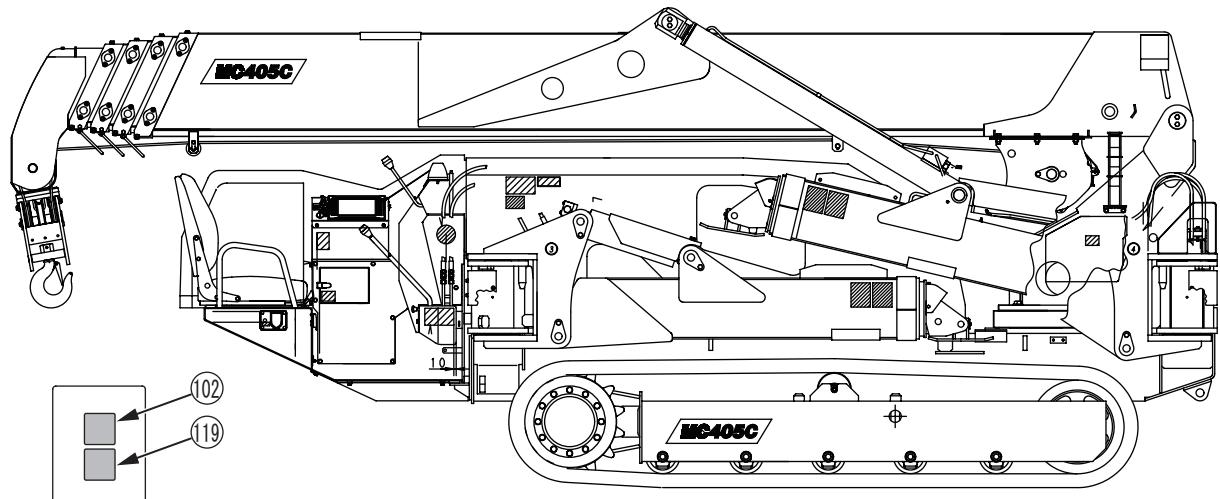
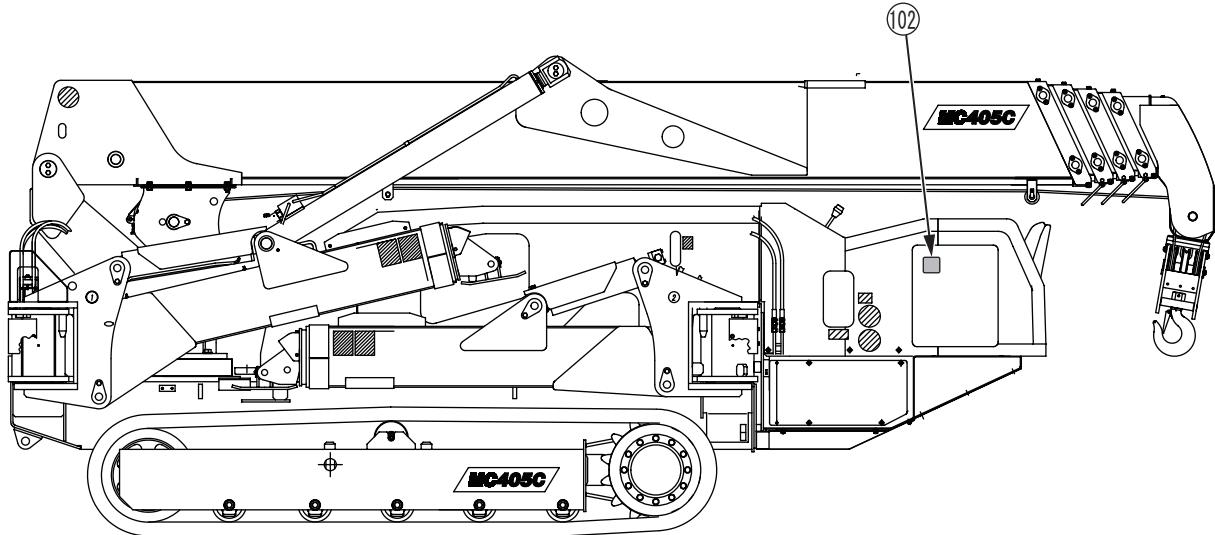


[117] 102-4880700



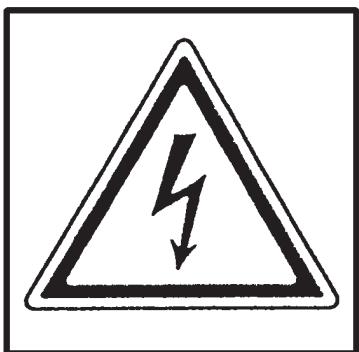
[118] 103-4590700

2.2.2 ELECTRIC MOTOR (OPTION)



Power supply box

EAM39030E



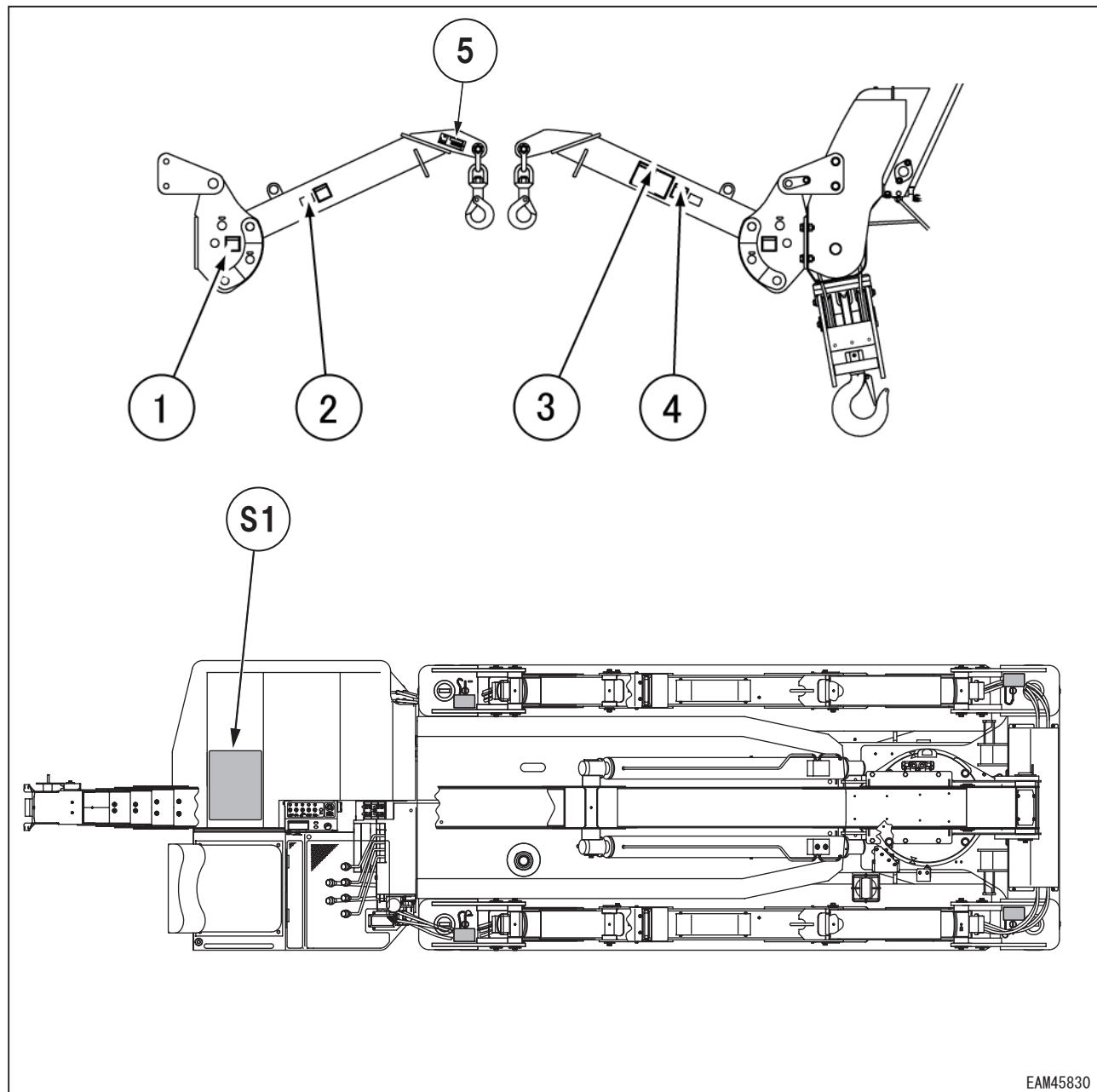
553-4267300

[116] 106-4860200

Maeda Seisakusho Co., Ltd.
TYPE MC405C
EN60204-3-2
Input
AC 380V/400V 3Ph
50Hz
21A
SCCR 5kA
104-5016000

[117] 102-4880700

2.2.3 850kg SEARCHER HOOK (OPTION)

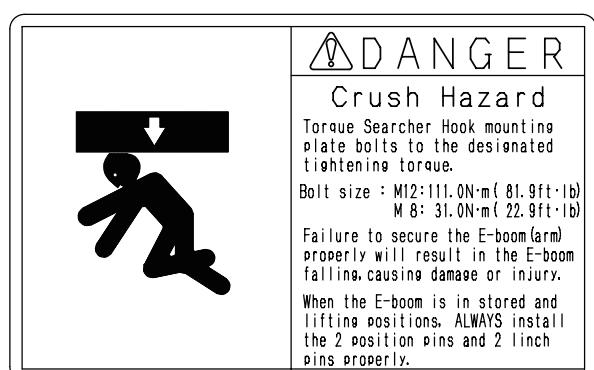




[1] 102-4608500(2 places)



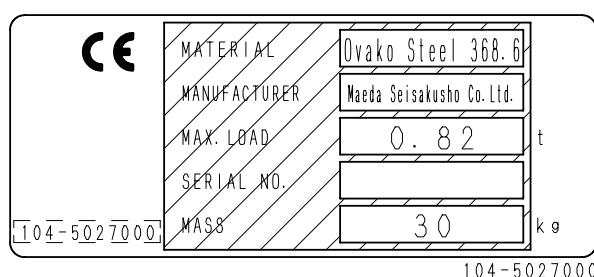
[2] 103-4635800



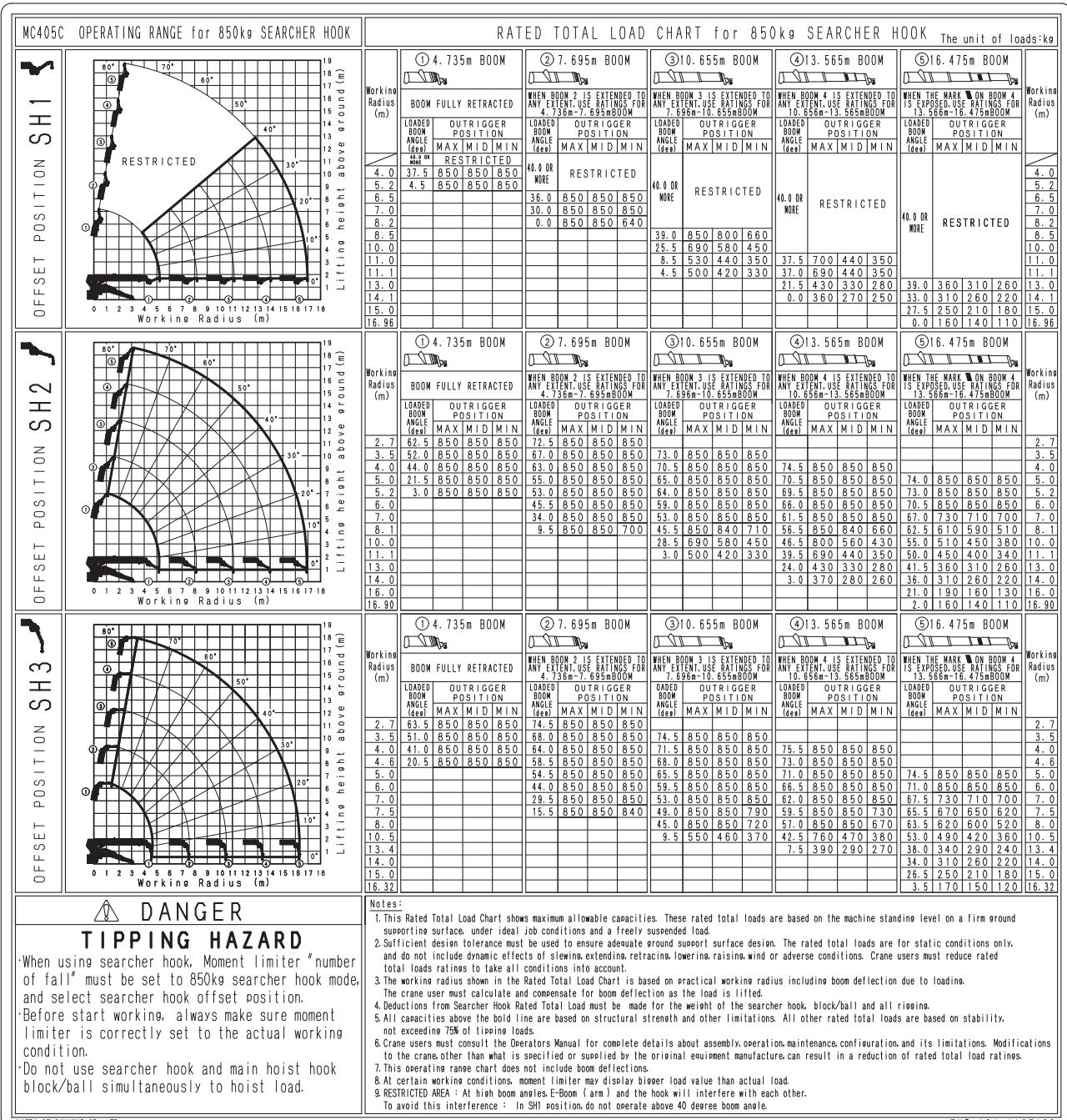
[3] 104-4770400



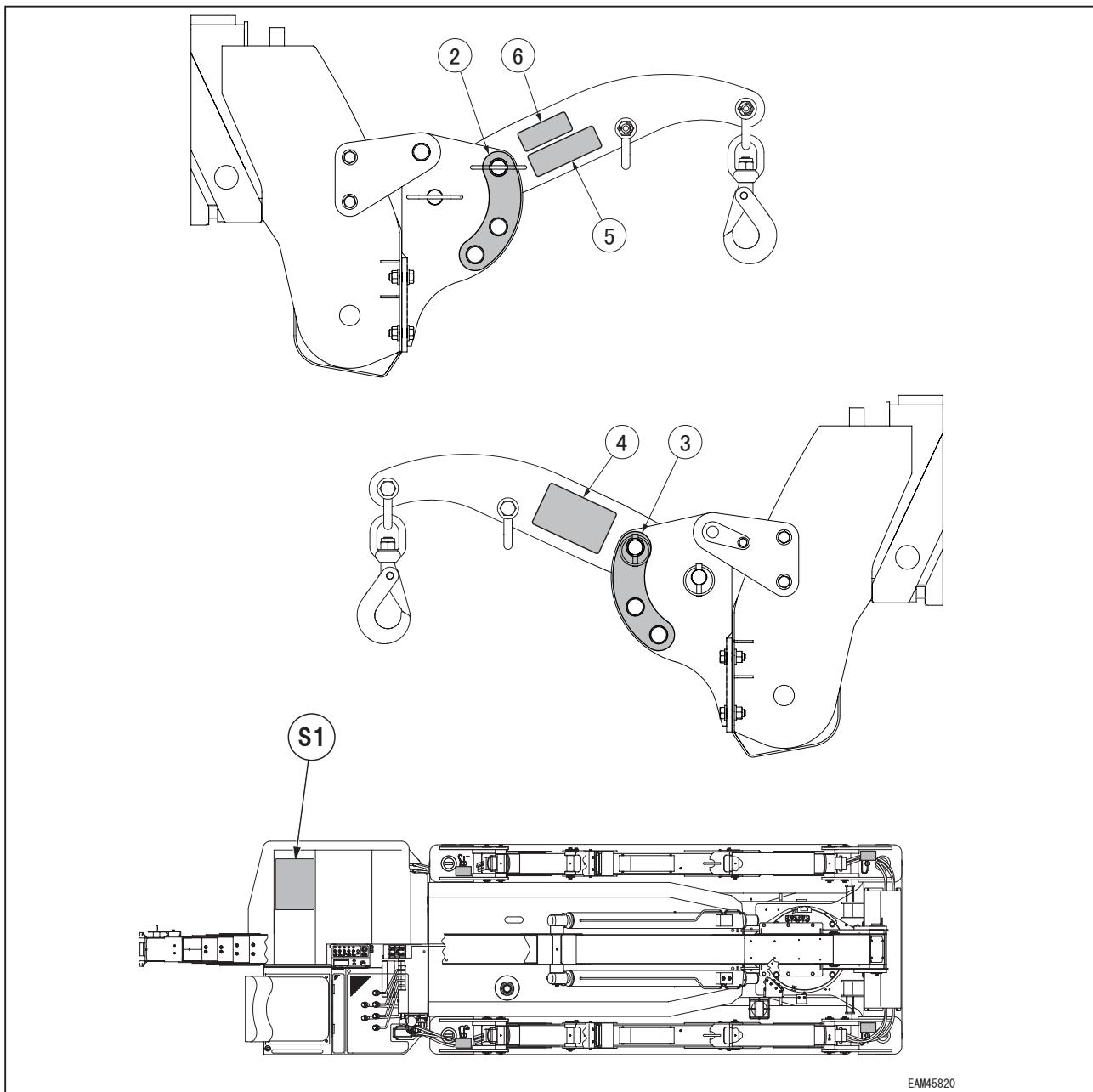
[4] 102-4621200(2 places)

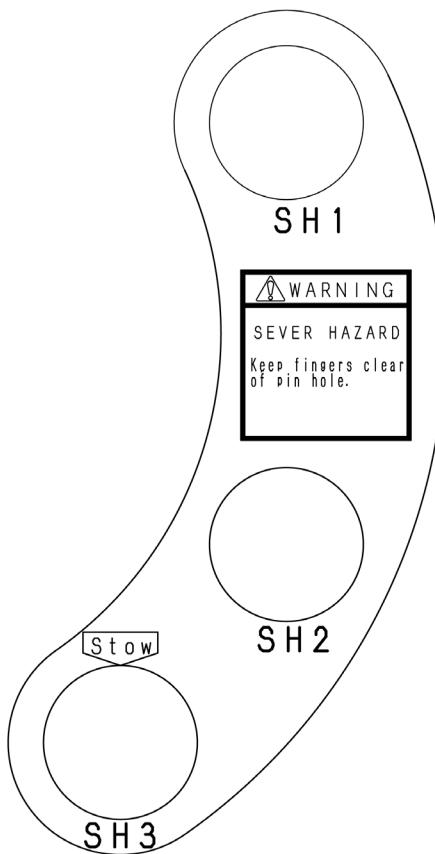


[5] 104-5027000

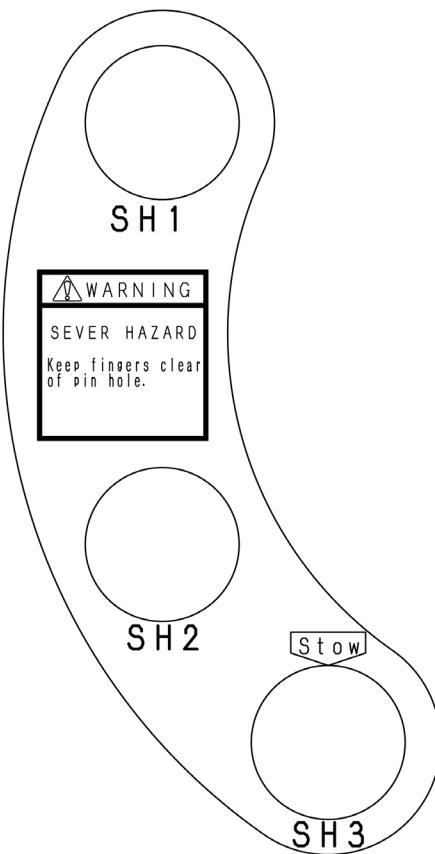


2.2.4 1.5t SEARCHER HOOK (OPTION)

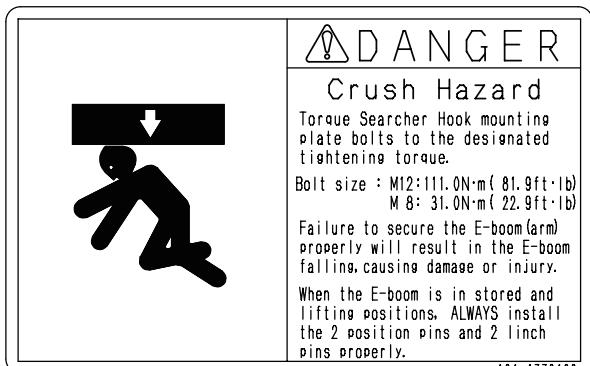




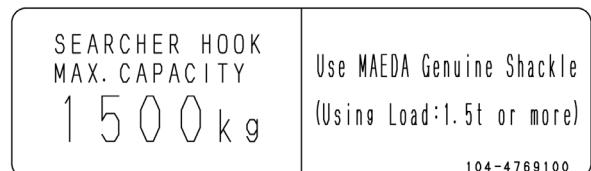
[2] 104-3444800



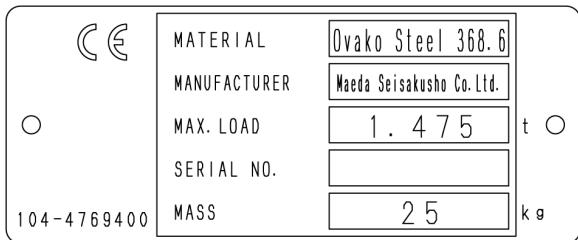
[3] 104-3444600



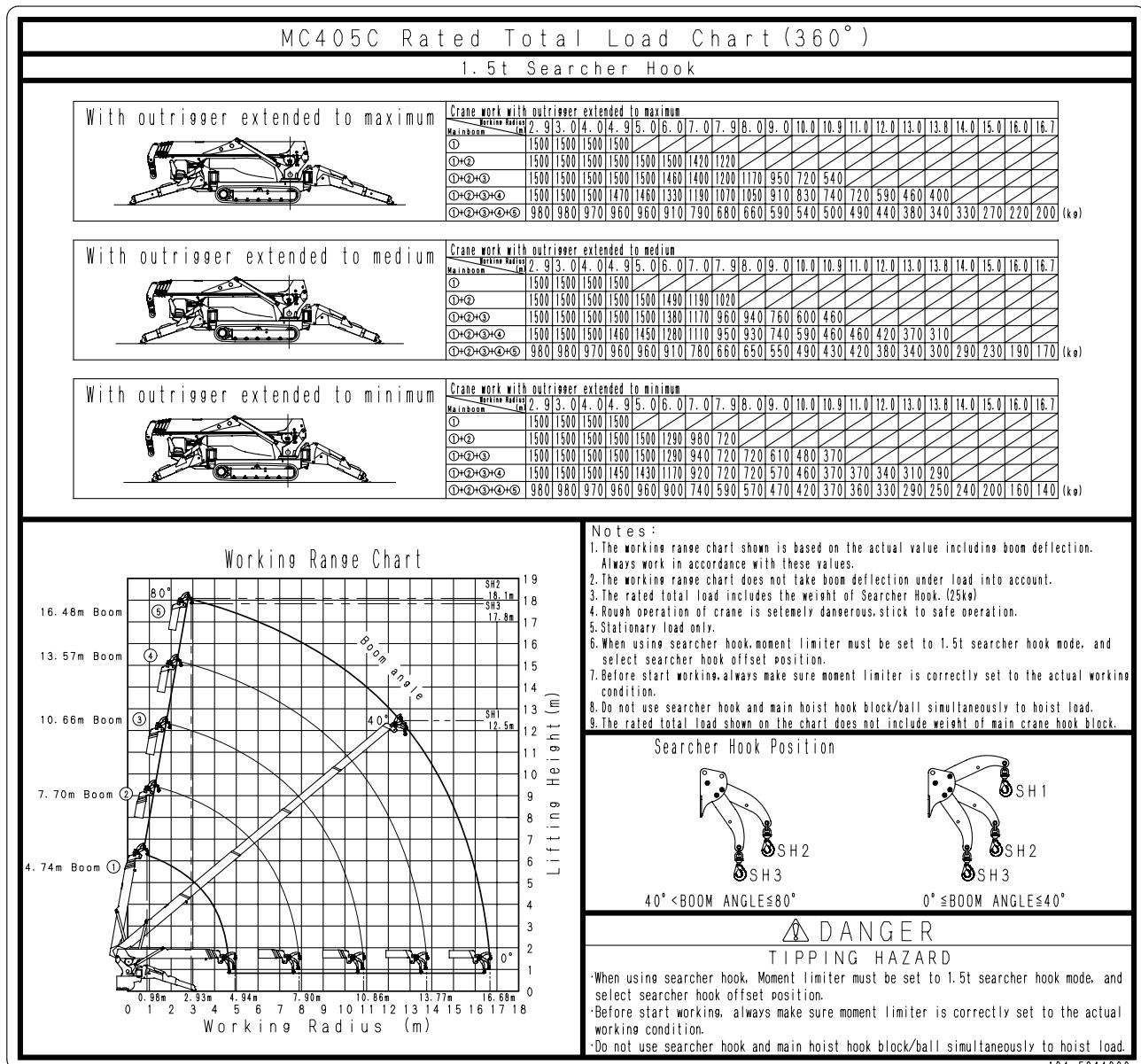
[4] 104-4770400



[5] 104-4769100

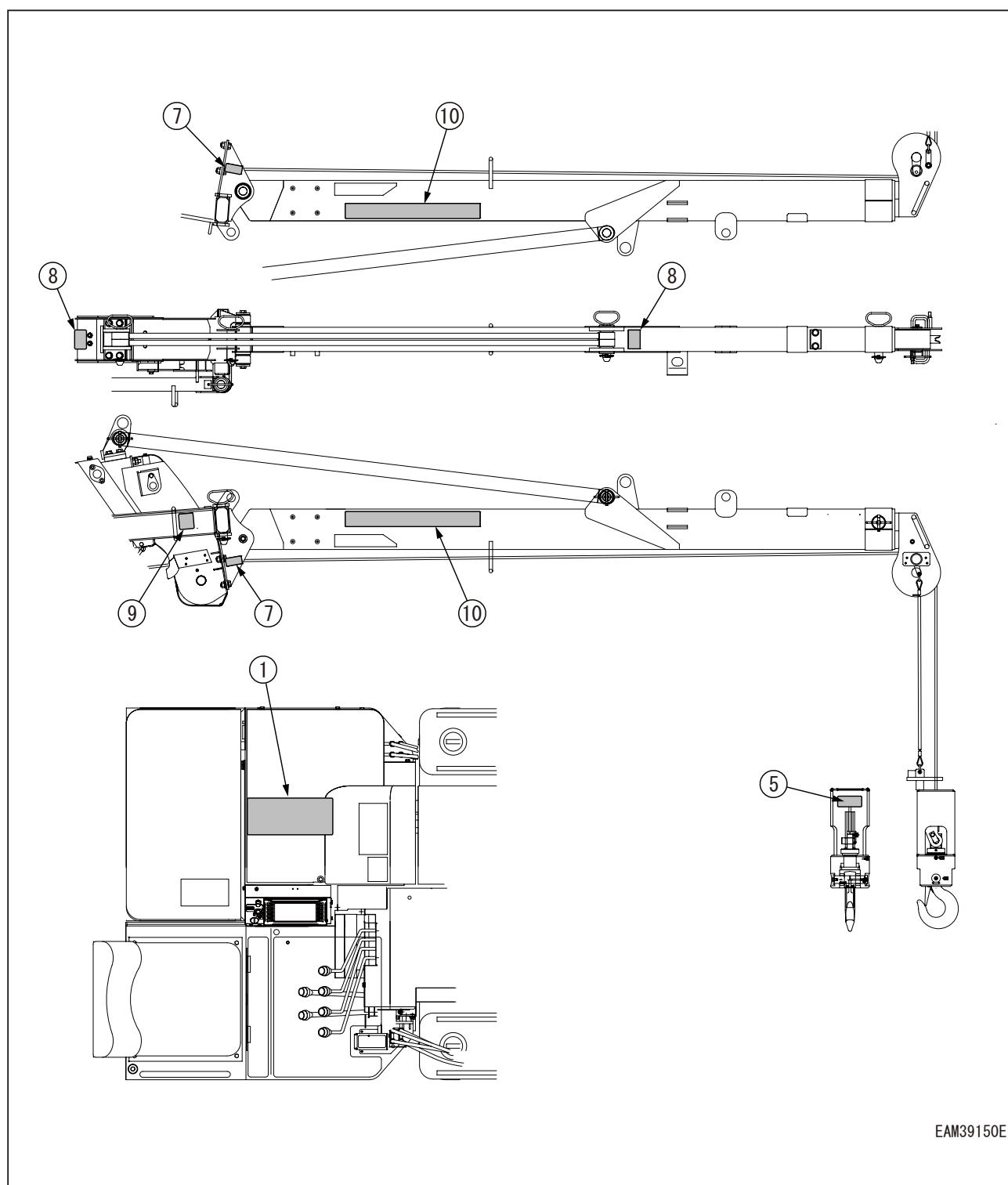


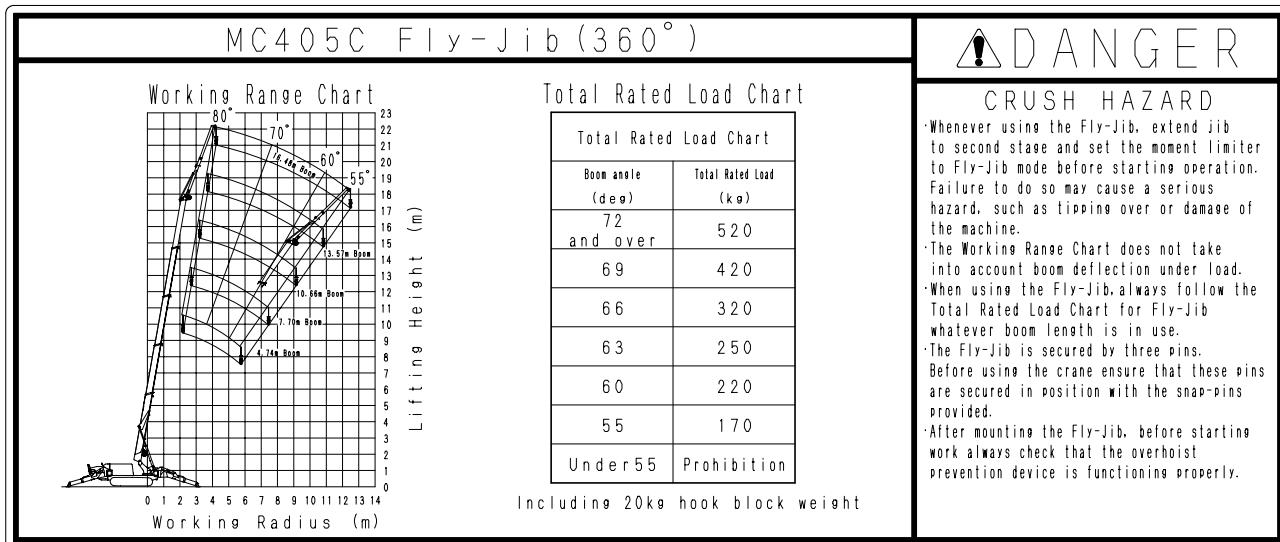
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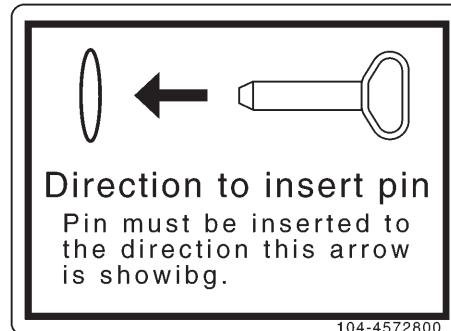
[B1] 104-5044000

2.2.5 FLY-JIB (OPTION)



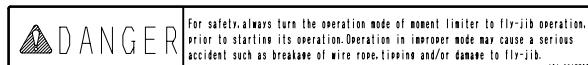
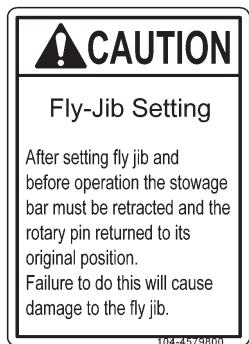


[1]104-502500



[7]104-4572700

[8]104-4572800



[9]104-4579800

[10]104-3317700

Chapter 3

SPECIFICATIONS

3.1 PRINCIPLE SPECIFICATION LIST

3.1.1 STANDARD AND ELECTRIC MOTOR OPTION SPECIFICATIONS

System / Item		MC405C-5 Standard	MC405C-5 Electric motor option
Mass and dimensions	Machine mass	5640kg	5790kg
	Overall length x width x height	4980mm x 1380mm x 1980mm	
	Distance between idler and sprocket	2100mm	
	Track gauge	1060mm	
	Track width	320mm	
Capacity	Maximum rated total load x working x radius	3.83t x 2.7m	
	Maximum working radius	16m	
	Maximum lifting height	16.8m	
Winch system	Method	Fixed displacement axial piston motor, Planetary reduction gear, Built-in disc brake, With counter balance valve	
	Winding speed	18.0m/min	11.7m/min
	Hoisting rope	IWRC 6 x WS (26) 0/0 Type B φ8 x 92m	
Boom telescoping system	Method	Sequentially telescoping hydraulic cylinder (3 pieces) + Sheave-embedded wire rope expansion device (1 piece), (With a hydraulic automatic locking device)	
	Boom type	Pentagonal section, hydraulic automatic extension, 5-stage boom (Stage 2/3: Sequentially telescoping, Stage 4/5: Simultaneous telescoping)	
	Boom length	4.735m – 7.695m – 10.655m – 13.565m – 16.475m	
	Boom telescoping stroke/time	11.7m/54.2sec (0.22 m/sec)	11.7m/61.6sec (0.19 m/sec)
Derrick system	Method	Direct push-type hydraulic double-acting cylinder (2 pieces), (With a hydraulic automatic locking device)	
	Derrick angle/ time	0 to 80 deg/24.5 sec (3.27 deg/sec)	0 to 80 deg/24.4 sec (3.28 deg/sec)
Slewing system	Method	Slew bearing, hydraulic motor drive, Reduction gear: Worm + Reduction spur gear, Brake: Worm-selflock	
	Slewing angle/ speed	360 deg. (continuous)/ 28.6sec (2.1min ⁻¹)	360 deg. (continuous)/ 33.7sec (1.8min ⁻¹)

System / Item		MC405C-5 Standard	MC405C-5 Electric motor option
Outrigger system	Method	Extension/ground: Direct push-type hydraulic cylinder (With a hydraulic automatic locking device)	
	Overall width of extended outriggers	(Front) 5118mm x (Right/left) 5786mm x (Rear) 5520mm	
Travelling system	Method	Hydraulic two-speed motor drive, Variable speed, Built-in brake	
	Travel speed	Forward/backward: 0 – 2.9 km/h	
	Gradeability	20 deg.	
	Ground pressure	50.4kPa(0.51kgf/cm ²)	51.7kPa (0.53kgf/cm ²)
Hydraulic system	Hydraulic pump	Double-throw variable piston pump (17cc/rev x 2)	Double-throw variable piston pump (13cc/rev x 2)
	Rated pressure	20.6MPa (210kgf/cm ²)	
	Hydraulic oil tank capacity	70L	
Engine	Model	Yanmar 3TNV88F-EPMB	
	Type	Vertical in-line 3-cylinder, Water cooled, 4-cycle (Direct injection type)	
	Displacement	1.642L(1642cc)	
	Rated output (continuous)	17.5kW/2400min ⁻¹ (23.8PS/2400rpm)	
	Fuel tank capacity	Diesel fuel/ 60L	
Battery	Model	115D31R (DC12V×1 piece)	
Electric motor	Motor specifications	Three-phase induction motor: 7.5kW 4P 380 V 50/60 Hz	
	Starting method	Inverter-controlled (30 to 60Hz), energy-saving mode available (Crane mode: 10-Hz operation after 5-minute consecutive no operation, automatic power off in 30 minutes)	
Safety device	Overwinding detector / automatic stop device, Over un-winding detector, Hydraulic safety valve, Hydraulic automatic locking device, Latch, Alarm buzzer, Level gauge, Crane tip-over alarm (an alarm issued in the event of the crane operation at 3-degree inclination and travelling at 15-degree inclination), Travelling lever lock, Travelling/crane/outrigger selector switch (designed to prevent the machine from craning at travelling), Outrigger safety device (outrigger interlock and crane interlock), Moment limiter (Working range limited), Working status lamp, Outrigger un-set warning, Inclination sensor, Operator protection restriction		

System / Item		MC405C-5 Standard	MC405C-5 Electric motor option
Option	White rubber crawler, 850kg searcher hook, 1.5t searcher hook, fly-jib, Protection bar		
Classification	Mobile crane ISO4301/2 Group A1		

3.1.2 REMOTE CONTROL SYSTEM SPECIFICATIONS

System / Item		Remote control	
Radio frequency		2402-2480 MHz band	
Transmission output		100 mW	
Channel spacing		1 MHz	
Reachable range of radio waves		100 m or longer (under a good condition where there is no radio interference)	
Unique address		Extracted and set from 1 million or more addresses at the time of shipment from factory	
Waterproof		IP65	
Transmitter antenna		Built-in type	
Operating status display	Status LED	Battery status display	
		No reception display	
	LED Monitor	Receiver power status display	
		Transmitter power status display	
		Feedback	
		Telegram display	
Safety device		Emergency stop switch (EMO)	
		Misoperation avoidance function during interruption of remote control	
		Automatic power OFF device (Auto power off device)	
		Transmitter stop function when battery capacity decreases	
		Alarm switch	
Transmitter voltage		Battery BA405000 (6 VDC at 1500 mAh)	
Receiver voltage		Power of crane main body (12 VDC)	
Continuous operating hours of Transmitter		Approximately 20 hours (Changes depending on usage environment)	
Ambient operating temperature		-20 °C to +70 °C	
Transmitter mass		Approx. 1.8 kg (including battery)	
Operation items of Transmitter	Operation lever	Outrigger 1 GROUND/EXTENSION / BOOM SLEW	
		Outrigger 2 GROUND/EXTENSION / BOOM EXTEND/RETRACT	
		Outrigger 3 GROUND/EXTENSION / HOOK HOIST UP/DOWN	
		Outrigger 4 GROUND/EXTENSION / BOOM RAISE/LOWER	
	Operation switch	Transmitter power switch	
		Engine start/stop switch	
		Speed selector switch	
		Boom raising cancel switch	
		Hook stowage/boom stowage switch	
		Horn switch	
		Emergency stop (EMO)/remote control power OFF switch	
	Rotary switch	Operation mode selector switch	
	Dial switch	Display operation switch	

3.1.3 850kg SEARCHER HOOK SPECIFICATIONS

System / Item		MC405C-5 Standard	MC405C-5 Electric motor option
Mass and dimensions	Machine mass	5670kg	5820kg
	Stowed length × width × height	5210mm x 1380mm x 2060mm	
Performance	Crane capacity	850kg	
	Maximum working radius	17.0m	

3.1.4 1.5t SEARCHER HOOK SPECIFICATIONS

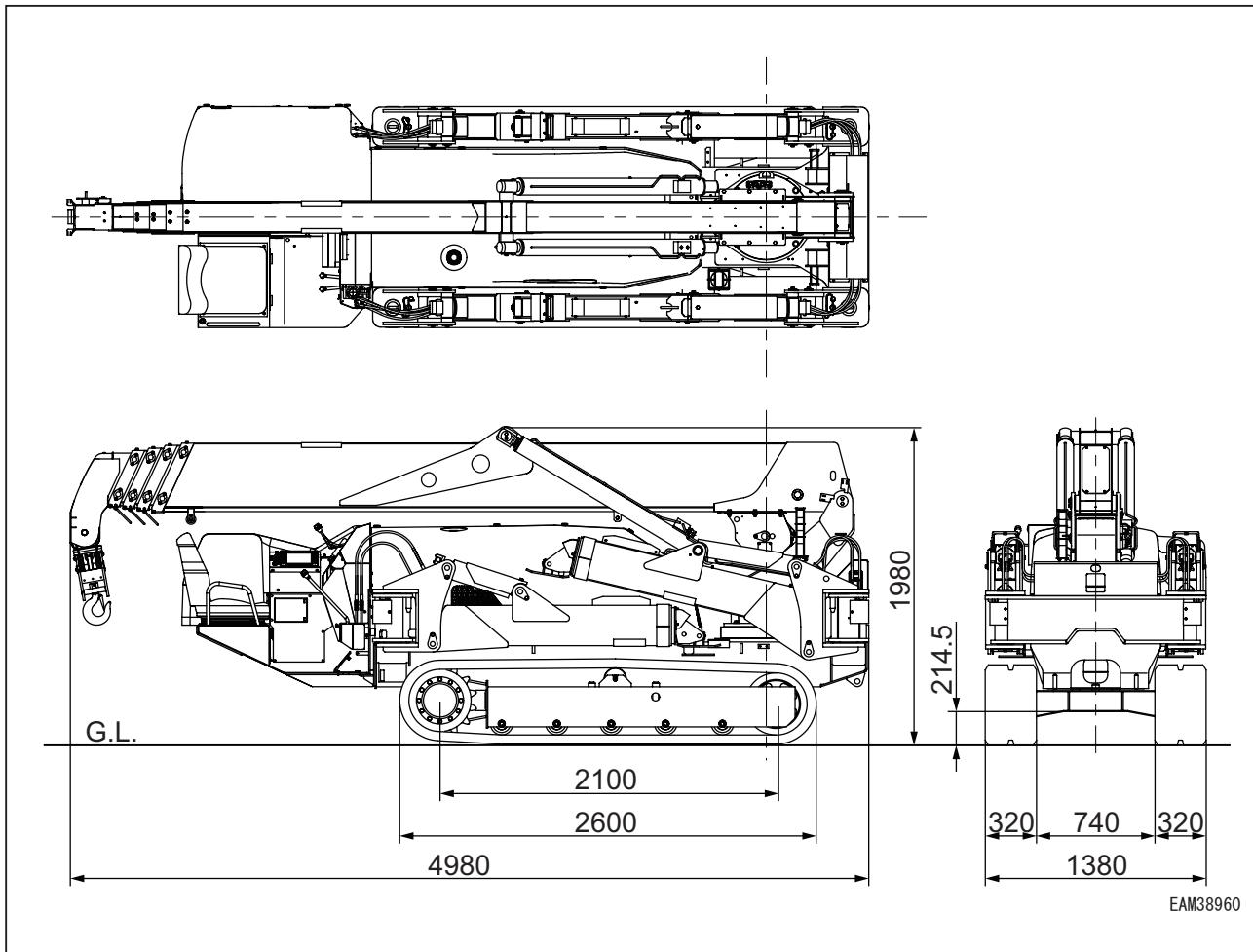
System / Item		MC405C-5 Standard	MC405C-5 Electric motor option
Mass and dimensions	Machine mass	5665kg	5815kg
	Stowed length × width × height	5320mm x 1380mm x 1980mm	
Performance	Crane capacity	1500kg	
	Maximum working radius	16.68m	

3.1.5 FLY-JIB SPECIFICATIONS

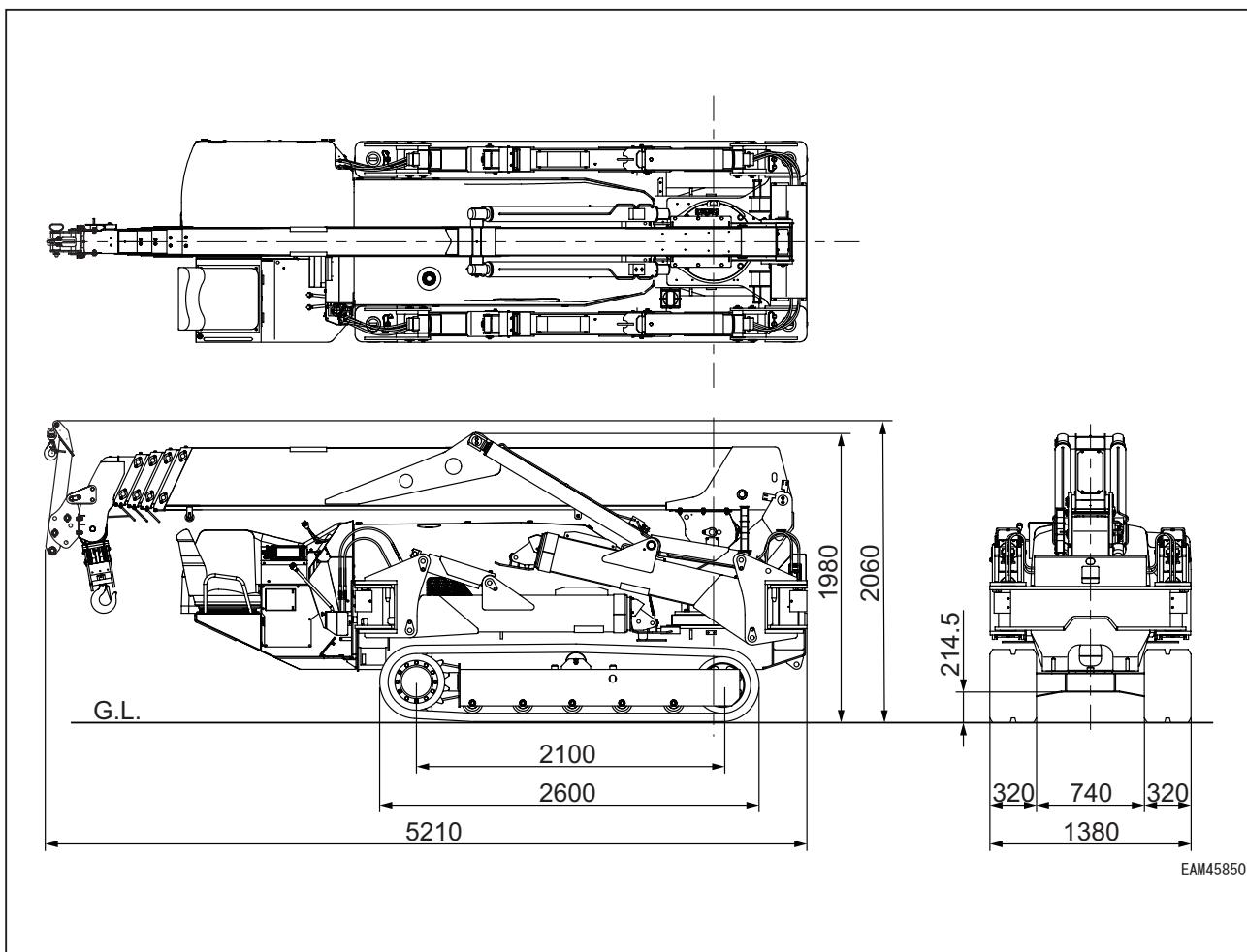
System / Item		MC405C-5 Standard	MC405C-5 Electric motor option
Mass and dimensions	Machine mass	5790kg	5940kg
Performance	Crane capacity	520kg	

3.2 DIMENSIONAL DRAWINGS

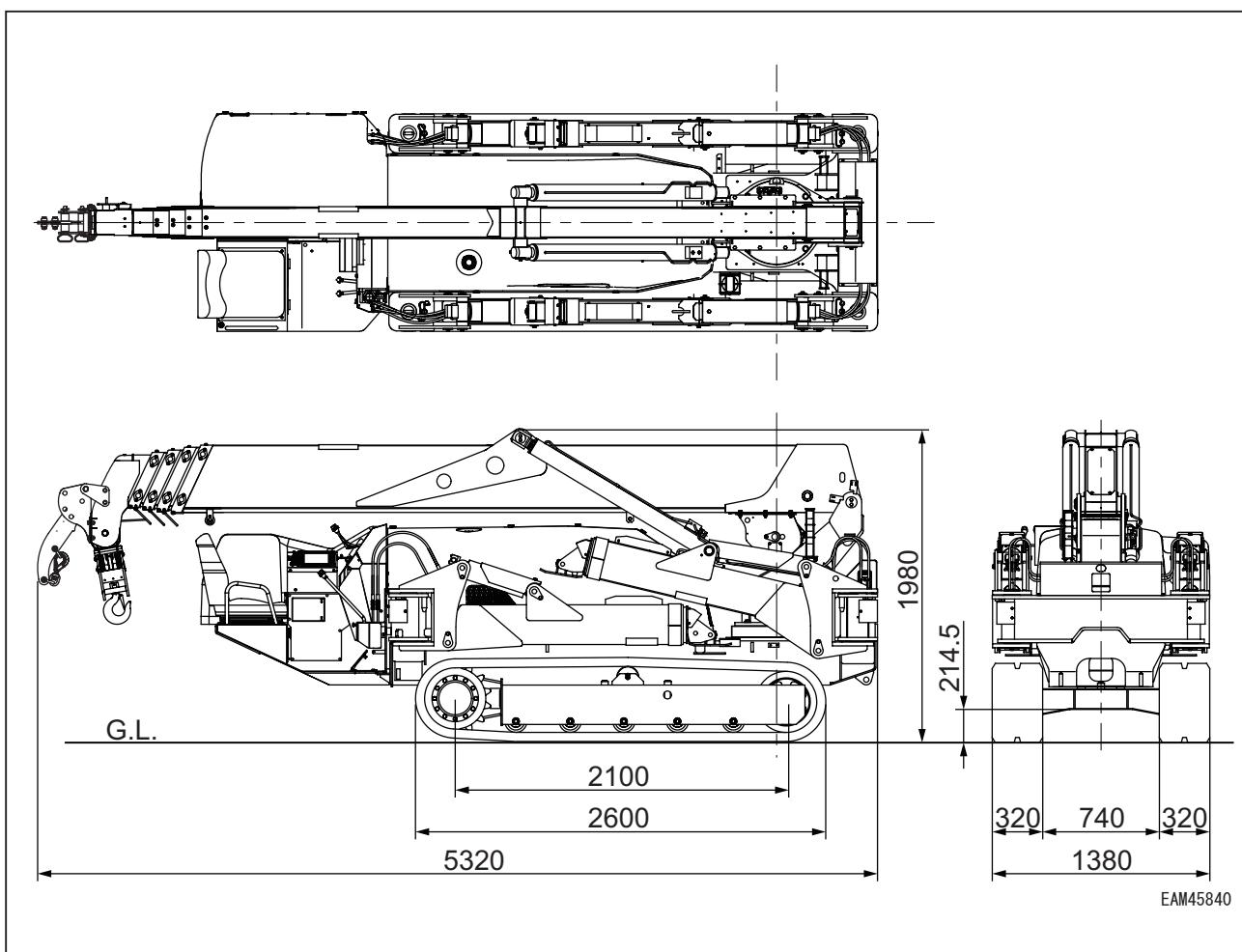
3.2.1 MACHINE DIMENSIONAL DRAWING



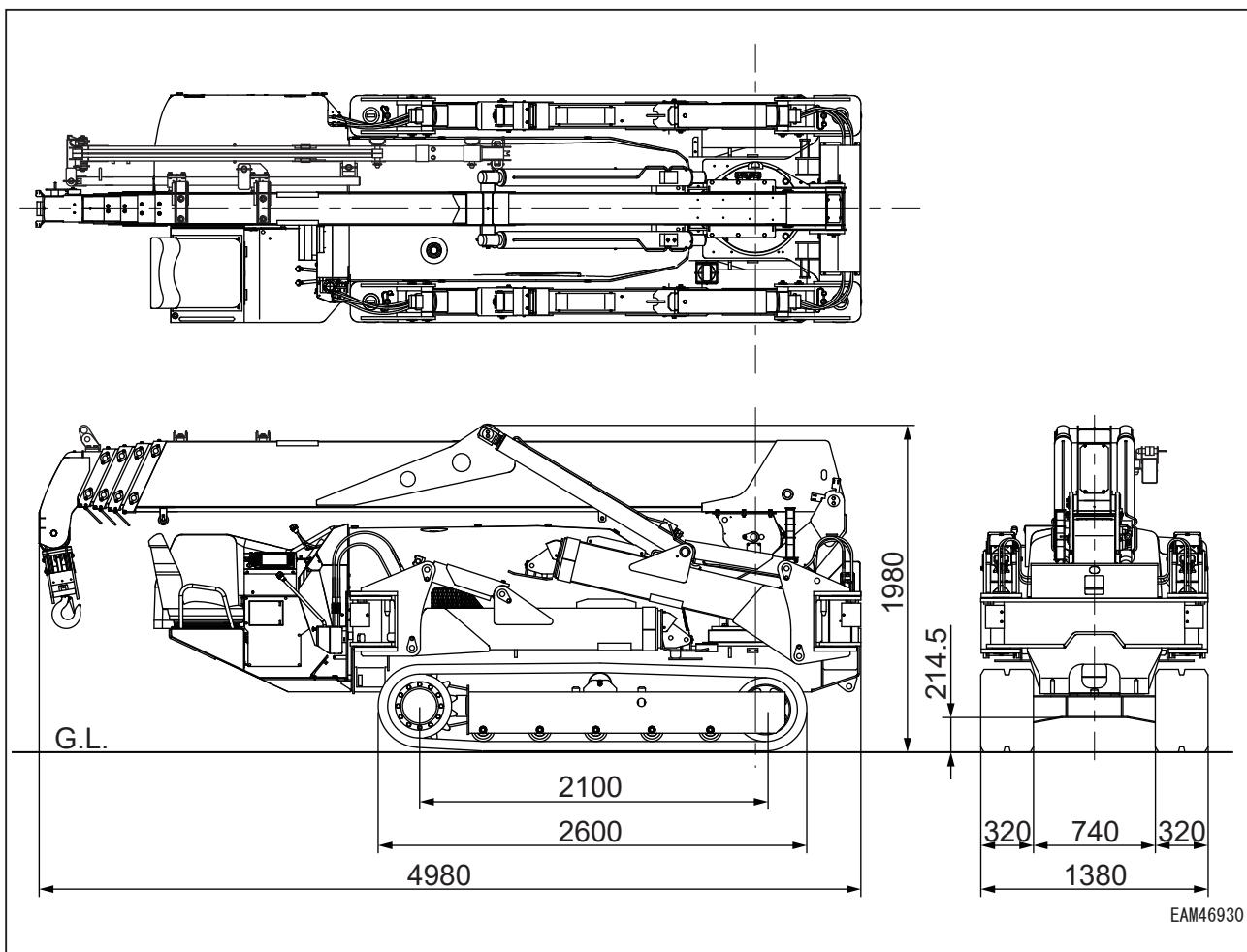
3.2.2 850kg SEARCHER HOOK DIMENSIONAL DRAWING



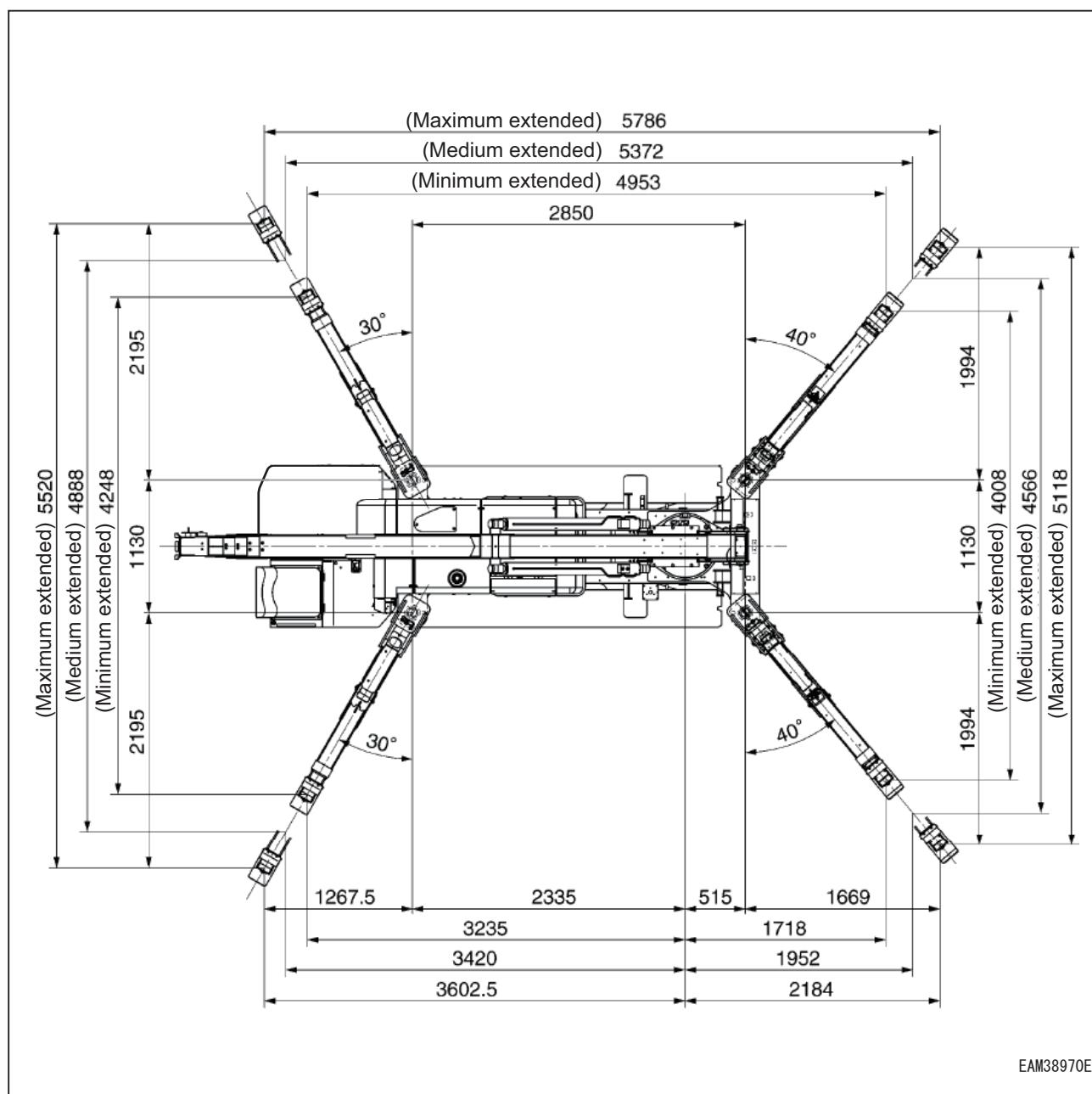
3.2.3 1.5t SEARCHER HOOK DIMENSIONAL DRAWING



3.2.4 FLY-JIB DIMENSIONAL DRAWING



3.3 OUTRIGGER WIDTH DIMENSIONAL DRAWING



3.4 RATED TOTAL LOAD CHARTS

3.4.1 HOW TO READ RATED TOTAL LOAD CHART

⚠ WARNING

- All the values provided in the rated total load chart are based on the assumption that the machine is placed on a level and firm surface.
- The machine may tip-over if proper outrigger setting or ground condition fails to be assured. Exercise due caution when performing crane operation.
- The values in the rated total load chart are determined based on the working radius allowing for deflection that is developed when load is applied to the boom.
- When extending boom (3) even if only slightly, crane operation should proceed to the extent of performance of “Boom (1) + (2) + (3).”
- When extending boom (4) even if only slightly, crane operation should proceed to the extent of performance of “Boom (1) + (2) + (3) + (4).”
- When half of the “” passes boom (3), crane operation should proceed to the extent of performance of “Boom (1) + (2) + (3) + (4) + (5)”.
- If the working radius exceeds that stated in the table even if only slightly, crane operation should proceed with respect to the rated total load corresponding to the working radius in the following table.
- The rated total load is a load including the mass of a hoisting accessory (hook: 50kg).
- Work with the value of the load table according to the outrigger extension “maximum, medium, minimum.”

The rated total load charts provide the maximum loads that the crane is capable of hoisting depending on the boom length by working radius.

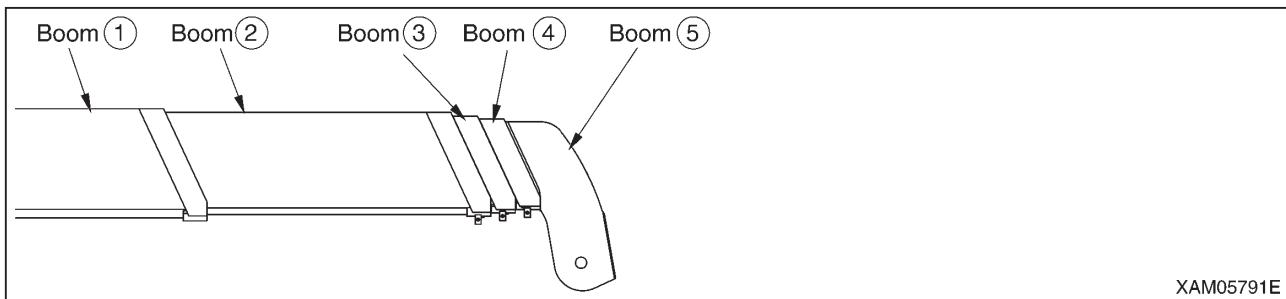
[1] BOOM LENGTH

The following figures illustrate the condition of the booms, “Boom (1)”, “Boom (1) + (2)”, “Boom (1) + (2) + (3)”, “Boom (1) + (2) + (3) + (4)”, and “Boom (1) + (2) + (3) + (4) + (5)” in the preceding boxes in the rated total load chart.

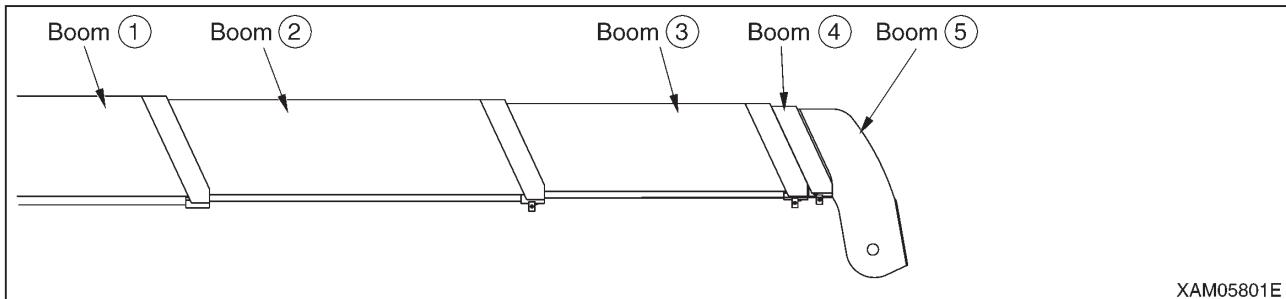
1. “Boom (1)”: All the booms are retracted.



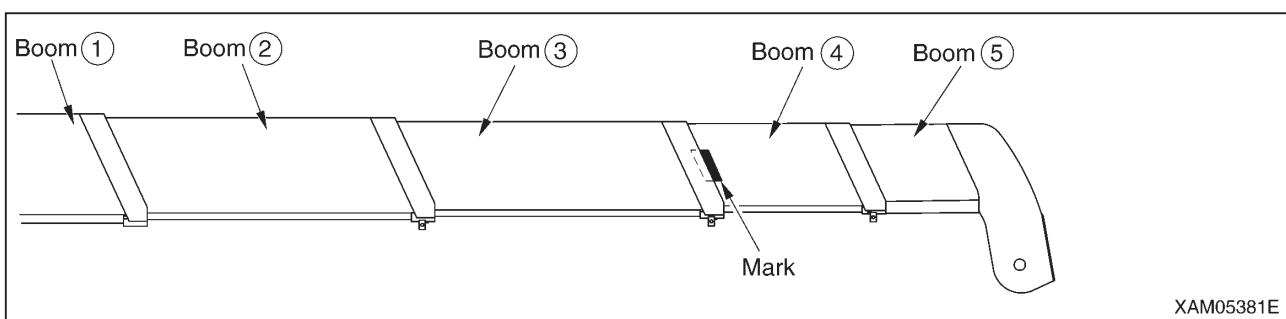
2. "Boom (1) + (2)": With booms (3), (4), and (5) retracted, boom (2) is fully extended.
 "Boom (1) + (2)" is to apply to crane operation with boom (2) extended even if only slightly.



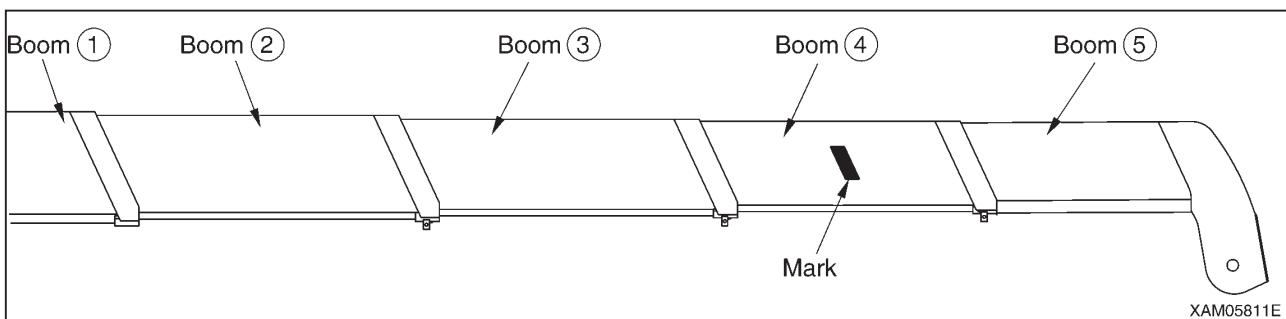
3. "Boom (1) + (2) + (3)": With booms (4) and (5) retracted, booms (2) and (3) are fully extended.
 "Boom (1) + (2) + (3)" is to apply to crane operation with boom (3) extended even if only slightly.



4. "Boom (1) + (2) + (3) + (4)": With booms (2) and (3) fully extended, booms (4) and (5) are extended at the medium (half of the "Mark" passes boom (3)).
 "Boom (1) + (2) + (3) + (4)" is to apply to crane operation with booms (4) and (5) extended even if only slightly.



5. "Boom (1) + (2) + (3) + (4) + (5)": All the booms are fully extended.
 "Boom (1) + (2) + (3) + (4) + (5)" is to apply to crane operation with half of the "Mark" on boom (4) passes boom (3).



3.4.2 RATED TOTAL LOAD CHART FOR STANDARD SPECIFICATION

[1] RATED TOTAL LOAD CHART - 4 FALLS

- The rated total load is a load including the mass of a hoisting accessory (hook: 50kg).
- Even if the rated total load displayed on the monitor is the maximum extension, if the length of the front and rear outrigger are different from each other, the rated total load is limited to 1010 kg for *1 and 720 kg for *2.

OUTRIGGER EXTENDED TO MAXIMUM							
BOOM (1)+(2)		BOOM (1)+(2)+(3)		BOOM (1)+(2)+(3)+(4)		BOOM (1)+(2)+(3)+(4)+(5)	
Working radius (m)	Rated total load (kg)	Working radius (m)	Rated total load (kg)	Working radius (m)	Rated total load (kg)	Working radius (m)	Rated total load (kg)
2.70	3830	3.50	3030	4.00	2230	5.00	1130
3.50	3030	4.00	2580	4.50	1930	5.50	980
4.00	2580	5.00	2030	5.00	1730	6.00	910
5.00	2030	6.00	1680	6.00	1400	7.00	760
6.00	1680	7.00	1380	7.00	1180	8.00	650
7.00	1380	8.00	1130 *1	8.00	1030	9.00	600
7.22	1330	9.00	880	9.00	930	10.00	550
--	--	10.18	580	10.00	830 *2	11.00	490
--	--	--	--	11.00	690	12.00	440
--	--	--	--	12.00	530	13.00	380
--	--	--	--	13.09	430	14.00	320
--	--	--	--	--	--	15.00	260
--	--	--	--	--	--	16.00	210

OUTRIGGER EXTENDED TO MEDIUM							
BOOM (1)+(2)		BOOM (1)+(2)+(3)		BOOM (1)+(2)+(3)+(4)		BOOM (1)+(2)+(3)+(4)+(5)	
Working radius (m)	Rated total load (kg)	Working radius (m)	Rated total load (kg)	Working radius (m)	Rated total load (kg)	Working radius (m)	Rated total load (kg)
2.70	3830	3.50	3030	4.00	2230	5.00	1130
3.50	3030	4.00	2580	4.50	1830	5.50	980
4.00	2580	5.00	1880	5.00	1630	6.00	910
5.00	1880	6.00	1430	6.00	1330	7.00	730
6.00	1430	7.00	1130	7.00	1080	8.00	630
7.00	1160	8.00	880	8.00	880	9.00	550
7.22	1120	9.00	740	9.00	730	10.00	480
--	--	10.18	490	10.00	530	11.00	430
--	--	--	--	11.00	480	12.00	380
--	--	--	--	12.00	430	13.00	330
--	--	--	--	13.09	330	14.00	280
--	--	--	--	--	--	15.00	220
--	--	--	--	--	--	16.00	180

OUTRIGGER EXTENDED TO MINIMUM							
BOOM (1)+(2)		BOOM (1)+(2)+(3)		BOOM (1)+(2)+(3)+(4)		BOOM (1)+(2)+(3)+(4)+(5)	
Working radius (m)	Rated total load (kg)	Working radius (m)	Rated total load (kg)	Working radius (m)	Rated total load (kg)	Working radius (m)	Rated total load (kg)
2.70	3830	3.50	3030	4.00	2230	5.00	1130
3.50	3030	4.00	2580	4.50	1830	5.50	980
4.00	2580	5.00	1680	5.00	1630	6.00	880
5.00	1680	6.00	1180	6.00	1180	7.00	730
6.00	1180	7.00	880	7.00	830	8.00	530
7.00	930	8.00	730	8.00	680	9.00	450
7.22	780	9.00	580	9.00	550	10.00	420
--	--	10.18	400	10.00	430	11.00	370
--	--	--	--	11.00	380	12.00	330
--	--	--	--	12.00	350	13.00	280
--	--	--	--	13.09	310	14.00	240
--	--	--	--	--	--	15.00	190
--	--	--	--	--	--	16.00	150

[2] RATED TOTAL LOAD CHART - 2 FALLS

- The rated total load is a load including the mass of a hoisting accessory (hook: 50kg).

OUTRIGGER EXTENDED TO MAXIMUM							
BOOM (1)+(2)		BOOM (1)+(2)+(3)		BOOM (1)+(2)+(3)+(4)		BOOM (1)+(2)+(3)+(4)+(5)	
Working radius (m)	Rated total load (kg)	Working radius (m)	Rated total load (kg)	Working radius (m)	Rated total load (kg)	Working radius (m)	Rated total load (kg)
2.70	1930	3.50	1930	4.00	1930	5.00	1130
3.50	1930	4.00	1930	4.50	1770	5.50	980
4.00	1930	5.00	1590	5.00	1590	6.00	910
5.00	1590	6.00	1330	6.00	1330	7.00	760
6.00	1330	7.00	1130	7.00	1130	8.00	650
7.00	1130	8.00	990	8.00	990	9.00	600
7.22	1100	9.00	880	9.00	880	10.00	550
--	--	10.18	580	10.00	790	11.00	490
--	--	--	--	11.00	690	12.00	440
--	--	--	--	12.00	530	13.00	380
--	--	--	--	13.09	430	14.00	320
--	--	--	--	--	--	15.00	260
--	--	--	--	--	--	16.00	210

OUTRIGGER EXTENDED TO MEDIUM								
BOOM (1)+(2)		BOOM (1)+(2)+(3)		BOOM (1)+(2)+(3)+(4)		BOOM (1)+(2)+(3)+(4)+(5)		
Working radius (m)	Rated total load (kg)	Working radius (m)	Rated total load (kg)	Working radius (m)	Rated total load (kg)	Working radius (m)	Rated total load (kg)	
2.70	1930	3.50	1930	4.00	1930	5.00	1130	
3.50	1930	4.00	1930	4.50	1770	5.50	980	
4.00	1930	5.00	1590	5.00	1590	6.00	910	
5.00	1590	6.00	1330	6.00	1330	7.00	730	
6.00	1330	7.00	1130	7.00	1080	8.00	630	
7.00	1130	8.00	880	8.00	880	9.00	550	
7.22	1100	9.00	740	9.00	730	10.00	480	
--	--	10.18	490	10.00	530	11.00	430	
--	--	--	--	11.00	480	12.00	380	
--	--	--	--	12.00	430	13.00	330	
--	--	--	--	13.09	330	14.00	280	
--	--	--	--	--	--	15.00	220	
--	--	--	--	--	--	16.00	180	

OUTRIGGER EXTENDED TO MINIMUM								
BOOM (1)+(2)		BOOM (1)+(2)+(3)		BOOM (1)+(2)+(3)+(4)		BOOM (1)+(2)+(3)+(4)+(5)		
Working radius (m)	Rated total load (kg)	Working radius (m)	Rated total load (kg)	Working radius (m)	Rated total load (kg)	Working radius (m)	Rated total load (kg)	
2.70	1930	3.50	1930	4.00	1930	5.00	1130	
3.50	1930	4.00	1930	4.50	1770	5.50	980	
4.00	1930	5.00	1590	5.00	1590	6.00	880	
5.00	1590	6.00	1180	6.00	1180	7.00	730	
6.00	1180	7.00	880	7.00	830	8.00	530	
7.00	930	8.00	730	8.00	680	9.00	450	
7.22	780	9.00	580	9.00	550	10.00	420	
--	--	10.18	400	10.00	430	11.00	370	
--	--	--	--	11.00	380	12.00	330	
--	--	--	--	12.00	350	13.00	280	
--	--	--	--	13.09	310	14.00	240	
--	--	--	--	--	--	15.00	190	
--	--	--	--	--	--	16.00	150	

[3] RATED TOTAL LOAD CHART - SINGLE FALL

- The rated total load is a load including the mass of a hoisting accessory (hook: 20kg).

OUTRIGGER EXTENDED TO MAXIMUM							
BOOM (1)+(2)		BOOM (1)+(2)+(3)		BOOM (1)+(2)+(3)+(4)		BOOM (1)+(2)+(3)+(4)+(5)	
Working radius (m)	Rated total load (kg)	Working radius (m)	Rated total load (kg)	Working radius (m)	Rated total load (kg)	Working radius (m)	Rated total load (kg)
2.70	970	3.50	970	4.00	970	5.00	970
3.50	970	4.00	970	4.50	970	5.50	970
4.00	970	5.00	970	5.00	970	6.00	900
5.00	970	6.00	970	6.00	970	7.00	750
6.00	970	7.00	970	7.00	970	8.00	640
7.00	970	8.00	970	8.00	970	9.00	590
7.22	970	9.00	870	9.00	870	10.00	540
--	--	10.18	570	10.00	780	11.00	480
--	--	--	--	11.00	680	12.00	430
--	--	--	--	12.00	520	13.00	370
--	--	--	--	13.09	420	14.00	310
--	--	--	--	--	--	15.00	250
--	--	--	--	--	--	16.00	200

OUTRIGGER EXTENDED TO MEDIUM							
BOOM (1)+(2)		BOOM (1)+(2)+(3)		BOOM (1)+(2)+(3)+(4)		BOOM (1)+(2)+(3)+(4)+(5)	
Working radius (m)	Rated total load (kg)	Working radius (m)	Rated total load (kg)	Working radius (m)	Rated total load (kg)	Working radius (m)	Rated total load (kg)
2.70	970	3.50	970	4.00	970	5.00	970
3.50	970	4.00	970	4.50	970	5.50	970
4.00	970	5.00	970	5.00	970	6.00	900
5.00	970	6.00	970	6.00	970	7.00	720
6.00	970	7.00	970	7.00	970	8.00	620
7.00	970	8.00	870	8.00	870	9.00	540
7.22	970	9.00	730	9.00	720	10.00	470
--	--	10.18	480	10.00	520	11.00	420
--	--	--	--	11.00	470	12.00	370
--	--	--	--	12.00	420	13.00	320
--	--	--	--	13.09	320	14.00	270
--	--	--	--	--	--	15.00	210
--	--	--	--	--	--	16.00	170

OUTRIGGER EXTENDED TO MINIMUM							
BOOM (1)+(2)		BOOM (1)+(2)+(3)		BOOM (1)+(2)+(3)+(4)		BOOM (1)+(2)+(3)+(4)+(5)	
Working radius (m)	Rated total load (kg)	Working radius (m)	Rated total load (kg)	Working radius (m)	Rated total load (kg)	Working radius (m)	Rated total load (kg)
2.70	970	3.50	970	4.00	970	5.00	970
3.50	970	4.00	970	4.50	970	5.50	970
4.00	970	5.00	970	5.00	970	6.00	870
5.00	970	6.00	970	6.00	970	7.00	720
6.00	970	7.00	870	7.00	820	8.00	520
7.00	920	8.00	720	8.00	670	9.00	440
7.22	770	9.00	570	9.00	540	10.00	410
--	--	10.18	390	10.00	420	11.00	360
--	--	--	--	11.00	370	12.00	320
--	--	--	--	12.00	340	13.00	270
--	--	--	--	13.09	300	14.00	230
--	--	--	--	--	--	15.00	180
--	--	--	--	--	--	16.00	140

3.4.3 RATED TOTAL LOAD CHART FOR 850kg SEARCHER HOOK

⚠ DANGER

- When using the searcher hook, be sure to set searcher hook mode for moment limiter.
- Fall mode/option mode and searcher hook position must be set as “searcher hook mode” when 850 kg searcher hook is used. Searcher hook position must be displayed on the searcher hook position display.
- Never use the searcher hook and the crane hook simultaneously.

1. This rated total load chart shows the maximum allowable capacities. These rated total loads are based on the machine standing level on a firm ground supporting surface, under ideal job conditions and a freely suspended load.
2. Sufficient design tolerance must be used to ensure adequate ground support surface design. The rated total loads are for static conditions only, and do not include dynamic effects of slewing, extending, retracting, lowering, raising, wind or adverse conditions. Crane users must reduce rated total loads ratings to take all conditions into account.
3. The Working radius shown in the rated total load chart is based on practical working radius including boom deflection due to loading. The crane user must calculate and compensate for boom deflection as the load is lifted.
4. Deductions from searcher hook rated total load must be made for the weight of 850 kg searcher hook (30 kg), block/ball and all rigging.

5. The capacity when using the searcher hook refers to the capacity with the crane hook detached.
6. If boom (3) is extended to any extent, work should be performed within the capacity for “10.655m Boom”.
7. If boom (4) is extended to any extent, work should be performed within the capacity for “13.565m Boom”.
8. When more than one half of the third mark is exposed from the boom (3), work should be carried out within the performance for the “16.475m Boom”.
9. All capacities above the bold line are based on structural strength and other limitations. All other rated total loads are based on stability not exceeding 75% of tipping loads.
10. Crane users must consult the Operators Manual for complete details about assembly, operation, maintenance, configuration, and its limitations. Modifications to the crane, other than what is specified or supplied by the original equipment manufacture, can result in a reduction of rated total load ratings.
11. This operating range chart does not include boom deflections.
12. At certain working conditions, moment limiter may display bigger load value the actual load.
13. RESTRICTED AREA : At high boom angles, E-Boom (arm) and the hook will interfere with each other.
To avoid this interference : In SH1 position, do not operate above 40 degrees boom angle.

[1] OFFSET POSITION SH1

Working Radius (m)	① 4.735m BOOM			② 7.695m BOOM			③ 10.655m BOOM			④ 13.565m BOOM			⑤ 16.475m BOOM			Working Radius (m)																		
	BOOM FULLY RETRACTED			WHEN BOOM 2 IS EXTENDED TO ANY EXTENT, USE RATINGS FOR 4.736m-7.695m BOOM			WHEN BOOM 3 IS EXTENDED TO ANY EXTENT, USE RATINGS FOR 7.696m-10.655m BOOM			WHEN BOOM 4 IS EXTENDED TO ANY EXTENT, USE RATINGS FOR 10.656m-13.565m BOOM			WHEN THE MARK ■ ON BOOM 4 IS EXPOSED, USE RATINGS FOR 13.566m-16.475m BOOM																					
40.0 OR MORE	LOADED BOOM ANGLE (deg)	OUTRIGGER POSITION	MAX	MID	MIN	40.0 OR MORE	LOADED BOOM ANGLE (deg)	OUTRIGGER POSITION	MAX	MID	MIN	40.0 OR MORE	LOADED BOOM ANGLE (deg)	OUTRIGGER POSITION	MAX	MID	MIN	40.0 OR MORE	LOADED BOOM ANGLE (deg)	OUTRIGGER POSITION	MAX	MID	MIN	40.0 OR MORE										
4.0	37.5	850	850	850		40.0 OR MORE	4.5	850	850	850		40.0 OR MORE	36.0	850	850	850		40.0 OR MORE	39.0	850	800	660		40.0 OR MORE	37.5	700	440	350		4.0				
5.2							5.2						30.0	850	850	850			5.2							37.0	690	440	350			5.2		
6.5													0.0	850	850	640									21.5	430	330	280			6.5			
7.0																								0.0	360	270	250			7.0				
8.2																																		8.2
8.5																																		8.5
10.0																																		10.0
11.0																																		11.0
11.1																																		11.1
13.0																																		13.0
14.1																																		14.1
15.0																																		15.0
16.96																																		16.96

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[2] OFFSET POSITION SH2

Working Radius (m)	① 4.735m BOOM			② 7.695m BOOM			③ 10.655m BOOM			④ 13.565m BOOM			⑤ 16.475m BOOM			Working Radius (m)															
	BOOM FULLY RETRACTED			WHEN BOOM 2 IS EXTENDED TO ANY EXTENT, USE RATINGS FOR 4.736m-7.695m BOOM			WHEN BOOM 3 IS EXTENDED TO ANY EXTENT, USE RATINGS FOR 7.696m-10.655m BOOM			WHEN BOOM 4 IS EXTENDED TO ANY EXTENT, USE RATINGS FOR 10.656m-13.565m BOOM			WHEN THE MARK ■ ON BOOM 4 IS EXPOSED, USE RATINGS FOR 13.566m-16.475m BOOM																		
40.0 OR MORE	LOADED BOOM ANGLE (deg)	OUTRIGGER POSITION	MAX	MID	MIN	40.0 OR MORE	LOADED BOOM ANGLE (deg)	OUTRIGGER POSITION	MAX	MID	MIN	40.0 OR MORE	LOADED BOOM ANGLE (deg)	OUTRIGGER POSITION	MAX	MID	MIN	40.0 OR MORE	LOADED BOOM ANGLE (deg)	OUTRIGGER POSITION	MAX	MID	MIN	40.0 OR MORE							
2.7	62.5	850	850	850		2.7	72.5	850	850	850		2.7	73.0	850	850	850		2.7	74.5	850	850	850		2.7							
3.5	52.0	850	850	850		3.5	67.0	850	850	850		3.5	70.5	850	850	850		3.5	70.5	850	850	850		3.5							
4.0	44.0	850	850	850		4.0	63.0	850	850	850		4.0	65.0	850	850	850		4.0	64.0	850	850	850		4.0							
5.0	21.5	850	850	850		5.0	55.0	850	850	850		5.0	59.0	850	850	850		5.0	59.0	850	850	850		5.0							
5.2	3.0	850	850	850		5.2	53.0	850	850	850		5.2	45.5	850	840	710		5.2	53.0	850	850	850		5.2							
6.0						6.0	34.0	850	850	850		6.0	28.5	690	580	450		6.0	34.0	850	850	850		6.0							
7.0						7.0	9.5	850	850	700		7.0	3.0	500	420	330		7.0	45.5	850	850	850		7.0							
8.1						8.1					8.1					8.1															8.1
10.0						10.0					10.0					10.0														10.0	
11.1						11.1					11.1					11.1														11.1	
13.0						13.0					13.0					13.0														13.0	
14.0						14.0					14.0					14.0														14.0	
16.0						16.0					16.0					16.0														16.0	
16.90						16.90					16.90					16.90															16.90

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[3] OFFSET POSITION SH3

Working Radius (m)	① 4.735m BOOM			② 7.695m BOOM			③ 10.655m BOOM			④ 13.565m BOOM			⑤ 16.475m BOOM			Working Radius (m)														
	BOOM FULLY RETRACTED			WHEN BOOM 2 IS EXTENDED TO ANY EXTENT, USE RATINGS FOR 4.736m-7.695m BOOM			WHEN BOOM 3 IS EXTENDED TO ANY EXTENT, USE RATINGS FOR 7.696m-10.655m BOOM			WHEN BOOM 4 IS EXTENDED TO ANY EXTENT, USE RATINGS FOR 10.656m-13.565m BOOM			WHEN THE MARK ■ ON BOOM 4 IS EXPOSED, USE RATINGS FOR 13.566m-16.475m BOOM																	
40.0 OR MORE	LOADED BOOM ANGLE (deg)	OUTRIGGER POSITION	MAX	MID	MIN	40.0 OR MORE	LOADED BOOM ANGLE (deg)	OUTRIGGER POSITION	MAX	MID	MIN	40.0 OR MORE	LOADED BOOM ANGLE (deg)	OUTRIGGER POSITION	MAX	MID	MIN	40.0 OR MORE	LOADED BOOM ANGLE (deg)	OUTRIGGER POSITION	MAX	MID	MIN	40.0 OR MORE						
2.7	63.5	850	850	850		2.7	74.5	850	850	850		2.7	74.5	850	850	850		2.7	74.5	850	850	850		2.7						
3.5	51.0	850	850	850		3.5	68.0	850	850	850		3.5	74.5	850	850	850		3.5	71.0	850	850	850		3.5						
4.0	41.0	850	850	850		4.0	64.0	850	850	850		4.0	68.0	850	850	850		4.0	65.5	850	850	850		4.0						
4.6	20.5	850	850	850		4.6	58.5	850	850	850		4.6	44.5	850	850	850		4.6	54.5	850	850	850		4.6						
5.0						5.0					5.0					5.0														5.0
6.0						6.0					6.0					6.0														6.0
7.0						7.0					7.0					7.0														7.0
7.5						7.5					7.5					7.5														7.5
8.0						8.0					8.0					8.0														8.0
10.5						10.5					10.5					10.5														10.5
13.4						13.4				</																				

3.4.4 RATED TOTAL LOAD CHART FOR 1.5t SEARCHER HOOK

1. When you use searcher hook, remove the main hook block. The capacity of searcher hook is the calculated under condition without the main hook block.
2. The working radius / lifting height chart does not include boom deflection.
3. The working radius shown in the rated total load chart is based on practical working radius including boom deflection due to loading.
4. Deductions from searcher hook rated total load chart must be made for the weight of the 1.5t searcher hook (25kg), block/ball and all rigging.

5. If boom (3) is extended to any extent, work should be performed within the capacity for boom (1) + (2) + (3).
6. If boom (4) is extended to any extent, work should be performed within the capacity for boom (1) + (2) + (3) + (4).
7. When more than one half of the  mark is exposed from the boom (3), work should be carried out within the capacity for boom (1) + (2) + (3) + (4) + (5).
8. Rough crane operation is very dangerous. Please keep safe crane work.
9. At certain working conditions, moment limiter may display bigger load value than the actual load.
10. When using the searcher hook, do not operate pick and carry.

Working Radius (m)	With Outrigger Max. Extended				
	Boom (1)	Boom (1) + (2)	Boom (1) + (2) + (3)	Boom (1) + (2) + (3) + (4)	Boom (1) + (2) + (3) + (4) + (5)
2.9	1500	1500	1500	1500	980
3.0	1500	1500	1500	1500	980
4.0	1500	1500	1500	1500	970
4.9	1500	1500	1500	1470	960
5.0	--	1500	1500	1460	960
6.0	--	1500	1460	1330	910
7.0	--	1420	1400	1190	790
7.9	--	1220	1200	1070	680
8.0	--	--	1170	1050	660
9.0	--	--	950	910	590
10.0	--	--	720	830	540
10.9	--	--	540	740	500
11.0	--	--	--	720	490
12.0	--	--	--	590	440
13.0	--	--	--	460	380
13.8	--	--	--	400	340
14.0	--	--	--	--	330
15.0	--	--	--	--	270
16.0	--	--	--	--	220
16.7	--	--	--	--	200

Working Radius (m)	With Outrigger Mid. Extended				
	Boom (1)	Boom (1) + (2)	Boom (1) + (2) + (3)	Boom (1) + (2) + (3) + (4)	Boom (1) + (2) + (3) + (4) + (5)
2.9	1500	1500	1500	1500	980
3.0	1500	1500	1500	1500	980
4.0	1500	1500	1500	1500	970
4.9	1500	1500	1500	1460	960
5.0	--	1500	1500	1450	960
6.0	--	1490	1380	1280	910
7.0	--	1190	1170	1110	780
7.9	--	1020	960	950	660
8.0	--	--	940	930	650
9.0	--	--	760	740	550
10.0	--	--	600	590	490
10.9	--	--	460	460	430
11.0	--	--	--	460	420
12.0	--	--	--	420	380
13.0	--	--	--	370	340
13.8	--	--	--	310	300
14.0	--	--	--	--	290
15.0	--	--	--	--	230
16.0	--	--	--	--	190
16.7	--	--	--	--	170

Working Radius (m)	With Outrigger Min. Extended				
	Rated Total Load (kg)				
Boom (1)	Boom (1) + (2)	Boom (1) + (2) + (3)	Boom (1) + (2) + (3) + (4)	Boom (1) + (2) + (3) + (4) + (5)	
2.9	1500	1500	1500	1500	980
3.0	1500	1500	1500	1500	980
4.0	1500	1500	1500	1500	970
4.9	1500	1500	1500	1450	960
5.0	--	1500	1500	1430	960
6.0	--	1290	940	1170	900
7.0	--	980	720	920	740
7.9	--	720	720	720	590
8.0	--	--	610	720	570
9.0	--	--	480	570	470
10.0	--	--	370	460	420
10.9	--	--	--	370	370
11.0	--	--	--	370	360
12.0	--	--	--	340	330
13.0	--	--	--	310	290
13.8	--	--	--	290	250
14.0	--	--	--	--	240
15.0	--	--	--	--	200
16.0	--	--	--	--	160
16.7	--	--	--	--	140

3.4.5 RATED TOTAL LOAD CHART FOR FLY-JIB

IMPORTANT

- The rated total load is a load including the weight of the hook block (20 kg).

Boom angle (degrees)	Rated total load(kg)
72 and over	520
69	420
66	320
63	250
60	220
55	170
Under 55	Prohibition

3.5 WORKING RADIUS/LIFTING HEIGHT

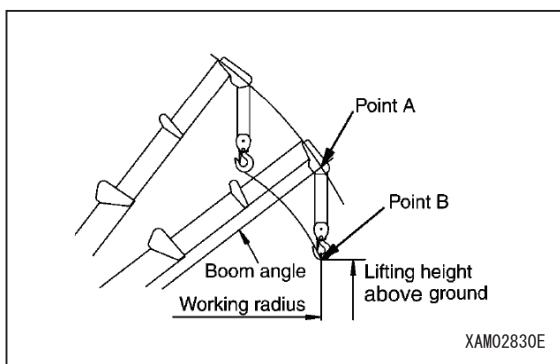
3.5.1 HOW TO READ WORKING RADIUS AND LIFTING HEIGHT DIAGRAMS

⚠ CAUTION

- The diagram of working radius and lifting height shows the relationships the working radius of this machine, boom angle, and lifting height above the ground with no object hoisted. The diagram has been made allowing for no deflection in the boom.
- The boom (4) in the diagram of working radius and lifting height represents a state that half of the “V” passes boom (3).

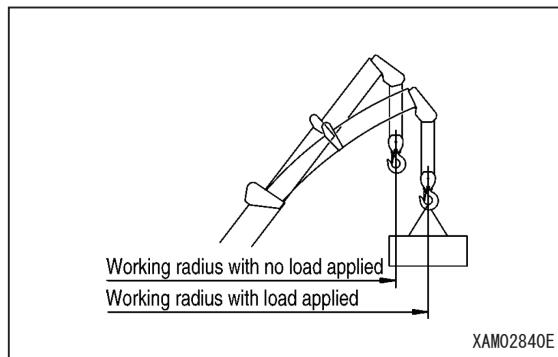
- Point A denotes a boom angle and point B denotes a lifting height above ground in the figure.

The same working radius is applied to points A and B.

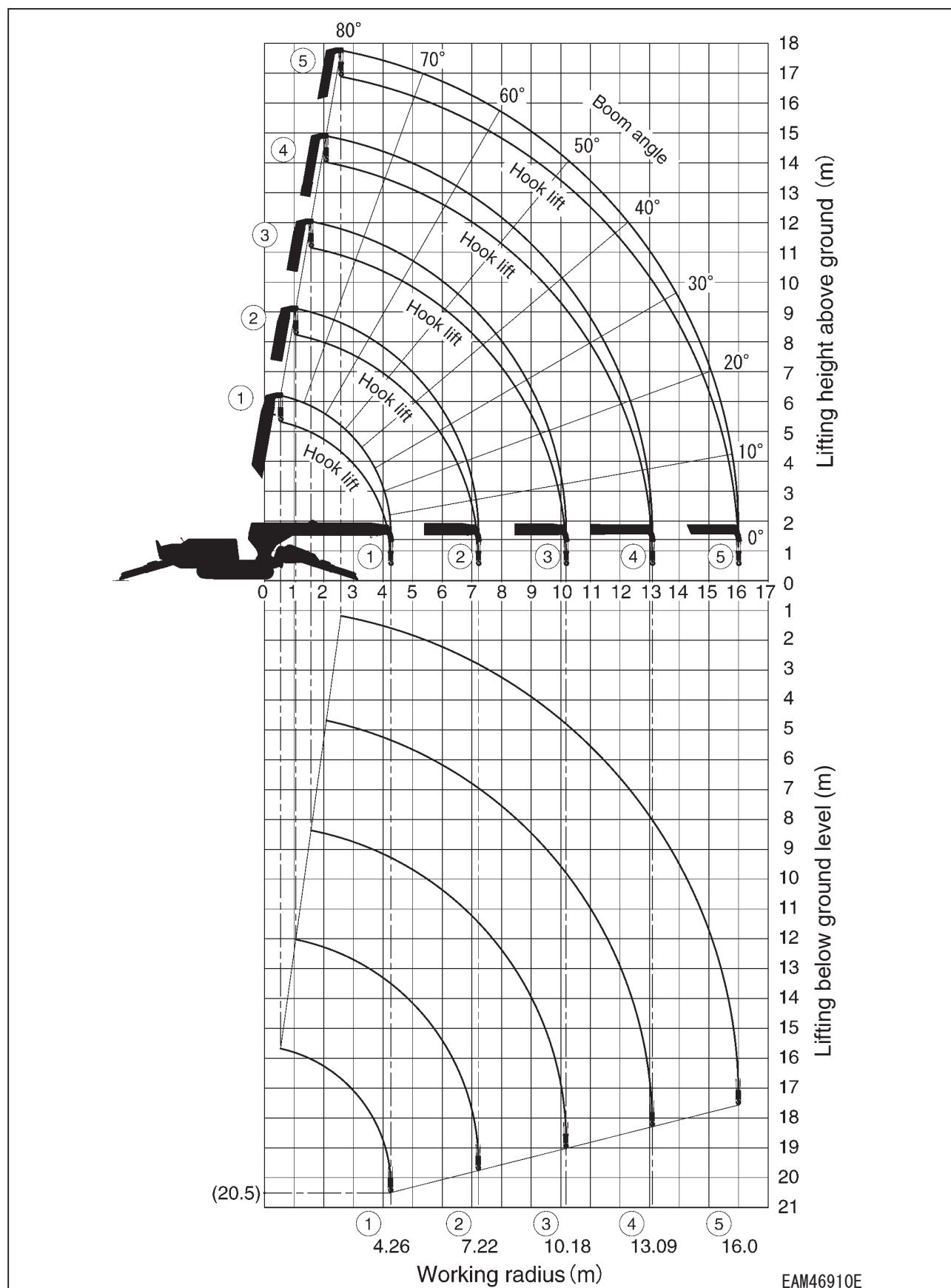


- The “diagram of working radius and lifting height” shows the relationships the working radius, boom angle, and lifting height at no load, allowing for no deflection in the boom. A deflection occurs in the boom when an object is hoisted, which causes the working radius to widen slightly. This is load radius.

The rated total load decreases with increase in the working radius. Actual crane operation requires the planning of work, allowing for sufficient clearance more than that provided in the diagram.



3.5.2 STANDARD

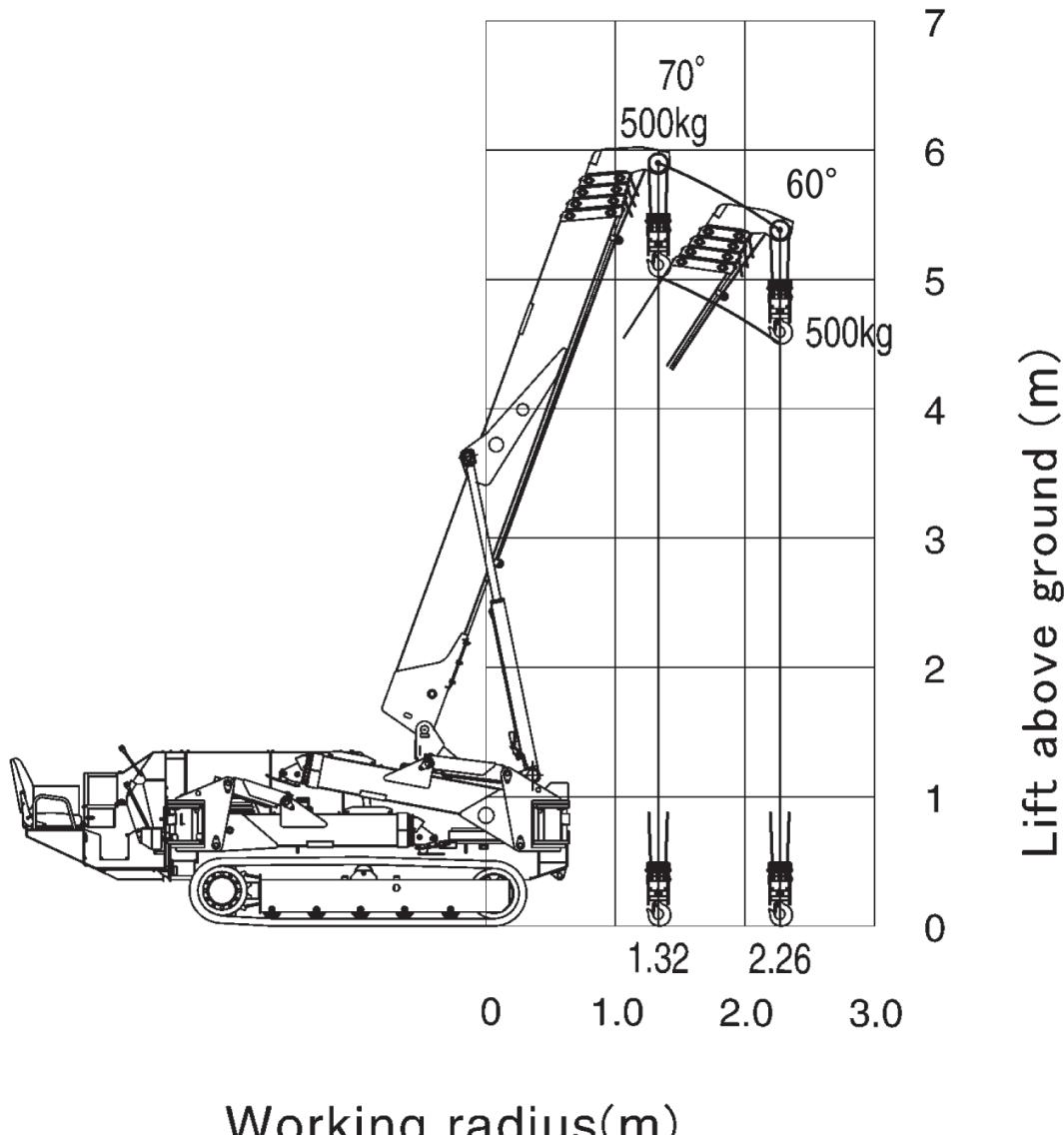


3.5.3 DURING PICK & CARRY

⚠ DANGER

When using Pick & Carry duties, follow these rules to prevent machine from tip-over.

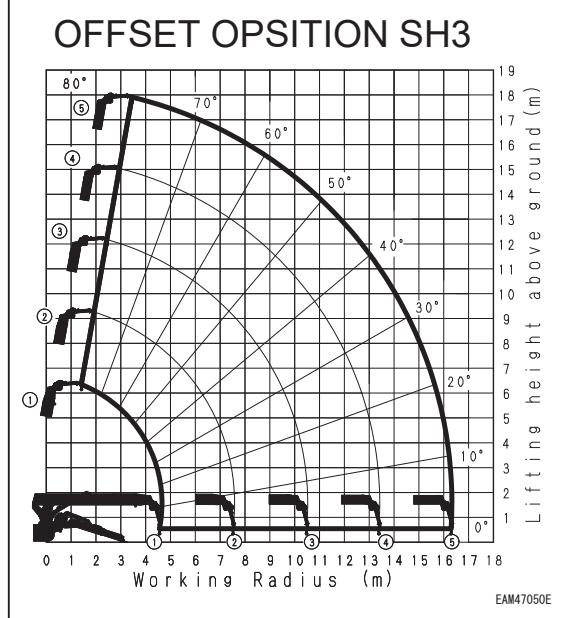
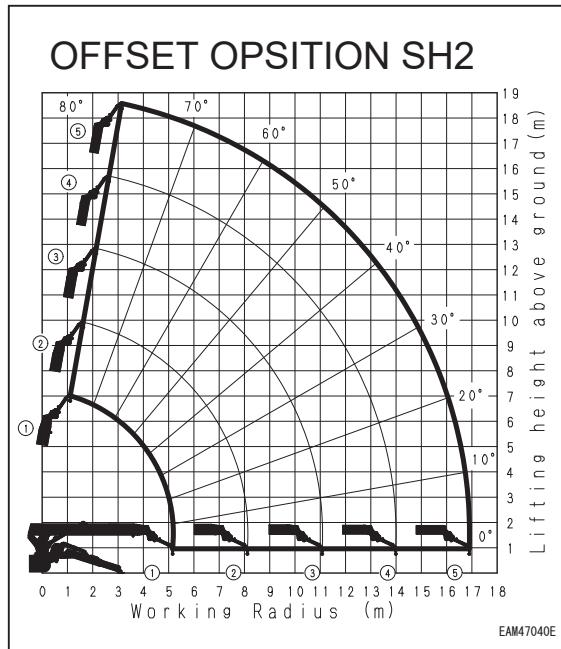
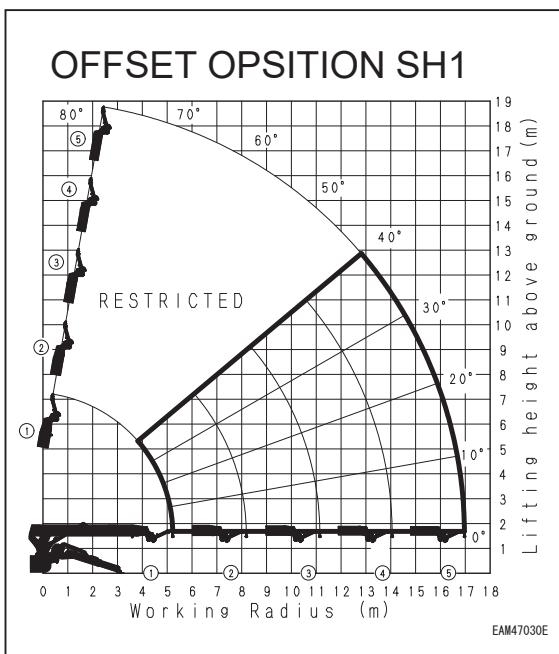
- Do not travel on a slope, soft ground or uneven ground.
- Do not slew. Avoid any sharp movements when stopping or starting.
- When travelling with a load, keep it low to the ground as possible.
- If the load slews, stop travelling until the load is still.



3.5.4 WORKING RADIUS/ LIFTING HEIGHT FOR 850kg SEARCHER HOOK

⚠ DANGER

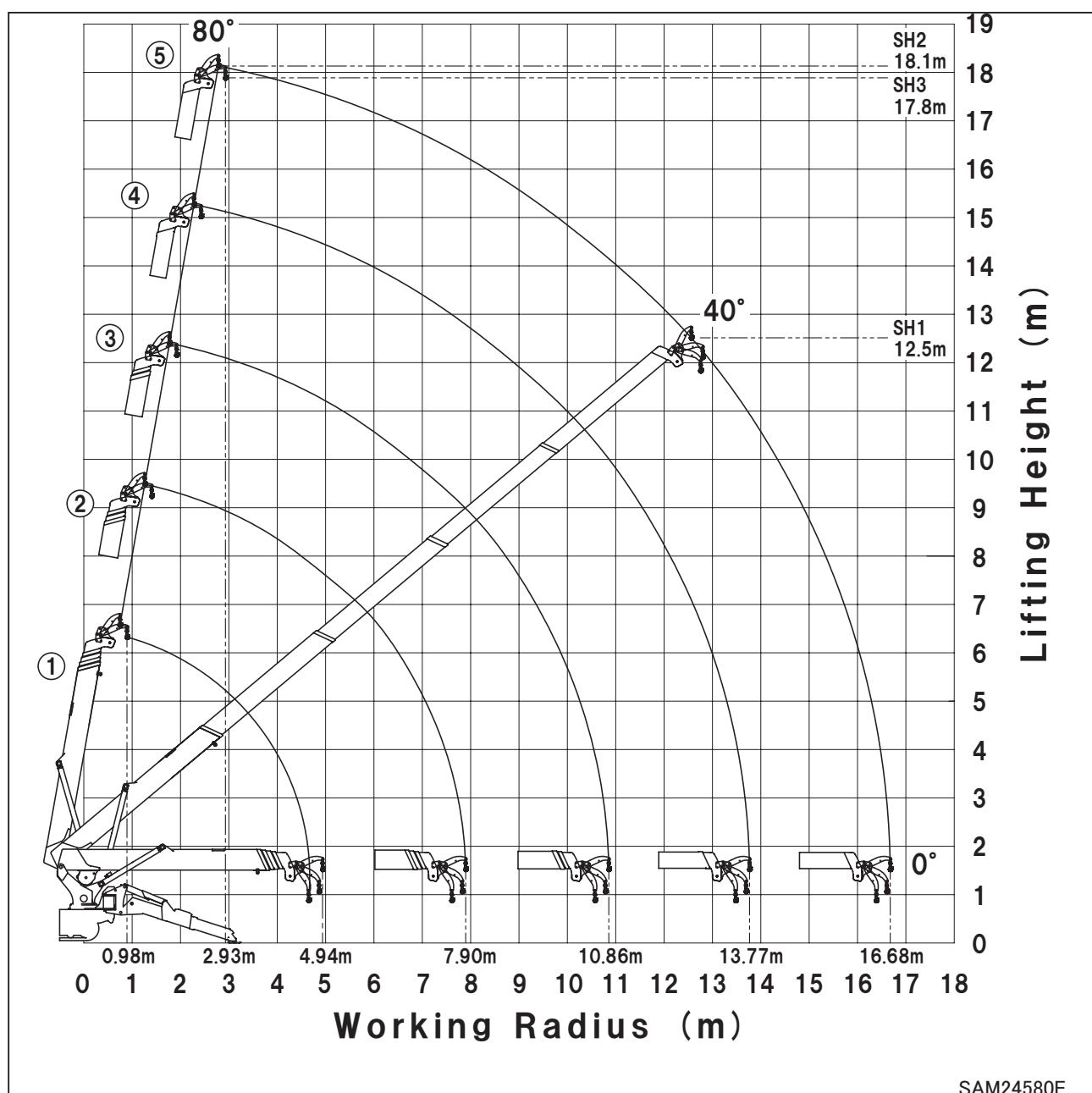
- When using 850 kg searcher hook, be sure to set 850 kg searcher hook mode.
- Number of falls mode and searcher hook offset position must be set as “850 kg searcher hook mode” when 850 kg searcher hook is used. Searcher hook offset position must be displayed on the searcher hook position display.
- Never use the searcher hook and the crane hook simultaneously.



3.5.5 WORKING RADIUS/LIFTING HEIGHT FOR 1.5t SEARCHER HOOK

⚠ WARNING

- The working range / lifting height chart shows relationship between working radius, boom angle and lifting height above ground of this machine with no load hoisted, and deflection of the boom is not included.
- When using the 1.5t searcher hook, be sure to set 1.5t searcher hook mode, then set moment limiter to match the “actual searcher hook position”.
- Do not use the searcher hook and the hook block of the crane main body at the same time.
- In searcher hook mode, do not use the hook block of the crane main body. The moment limiter value may not be displayed correctly, and a serious injury may result if the machine falls or breaks.

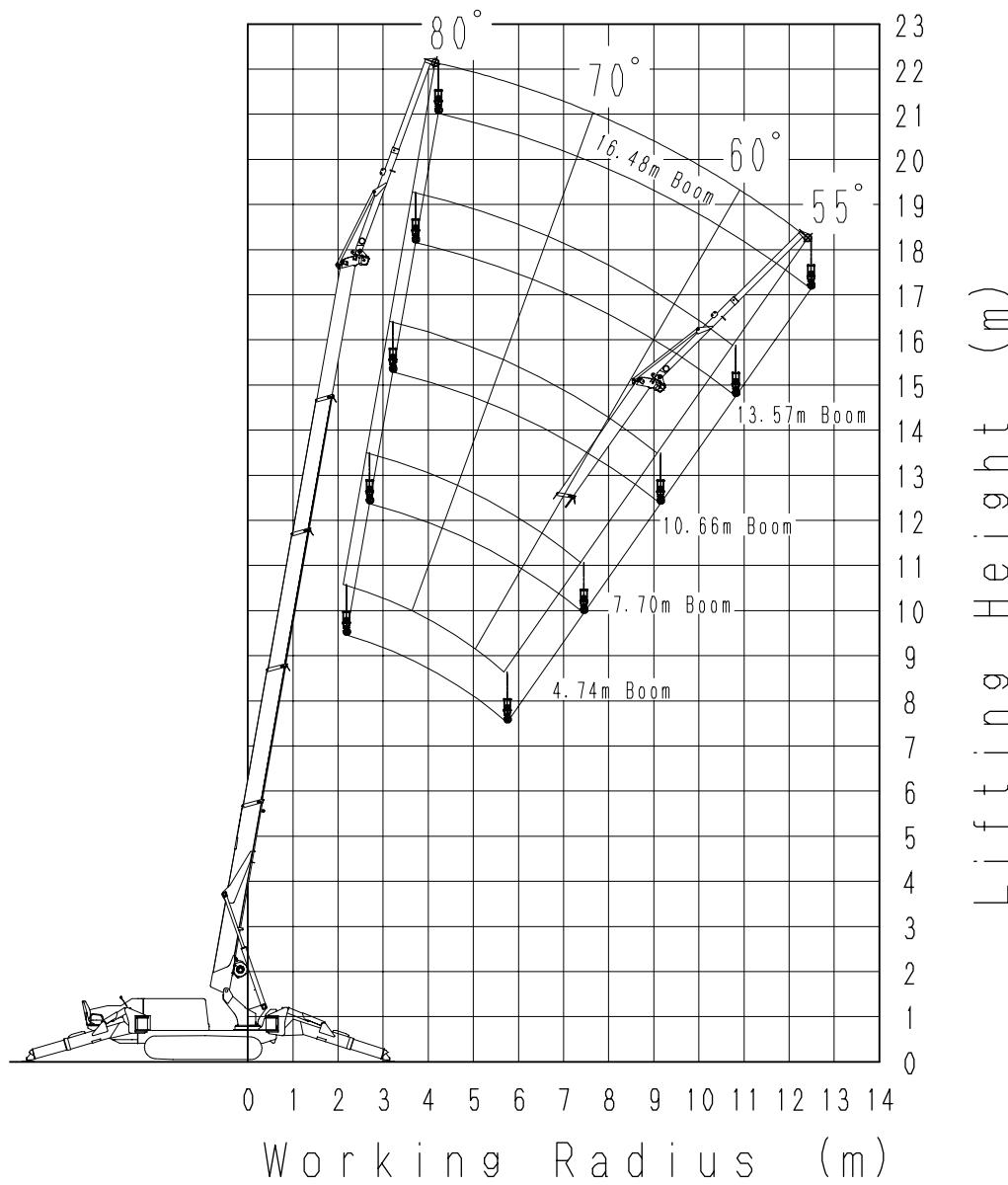


3.5.6 WORKING RADIUS/LIFTING HEIGHT FOR FLY-JIB

WARNING!

The diagram of working radius and lifting height shows the relationships the working radius of this machine, boom angle, and lifting height above the ground with no object hoisted. The diagram has been made allowing for no deflection in the boom.

Working Range Chart



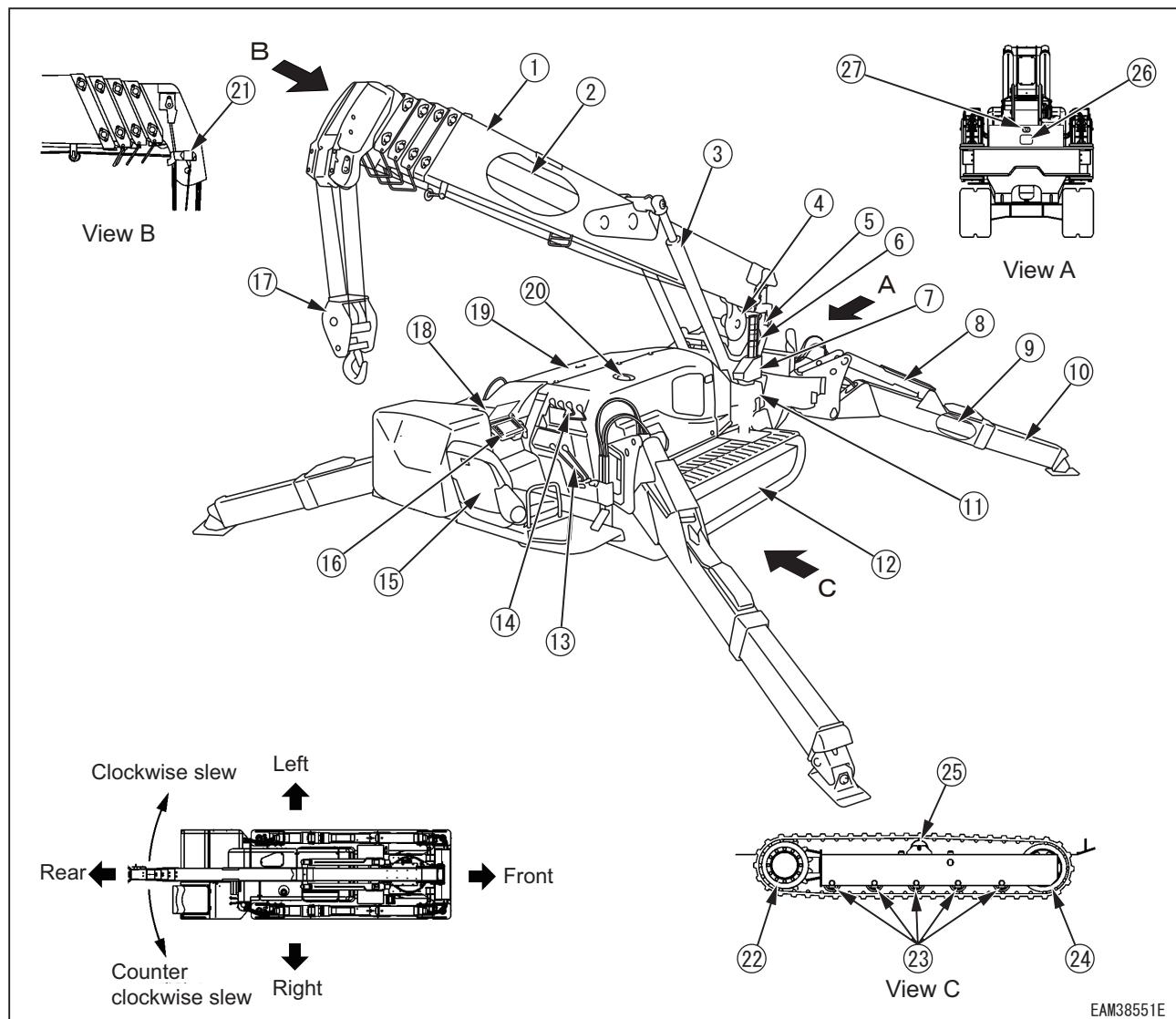
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Chapter 4

COMPONENT AND FUNCTIONS

4.1 COMPONENT NAMES

4.1.1 MACHINE COMPONENT



(1) Boom	(13) Travel control
(2) Boom telescoping cylinder (Inside the boom)	(14) Crane control
(3) Boom derrick cylinder	(15) Operation seat
(4) Winch	(16) Instrument panel
(5) Post	(17) Hook block
(6) Working status lamp	(18) Main controller(TTC540)(Inside rear cover)
(7) Sub controller (TTC30) (Inside the cover on the post)	(19) Hydraulic oil tank (Inside machinery cover)
(8) Outrigger grounding cylinder	(20) Fuel tank (Inside machinery cover)
(9) Outrigger extension cylinder (Built in the box)	(21) Overwinding detector
(10) Outrigger	(22) Travelling motor and sprocket
(11) Slewing device	(23) Track roller
(12) Rubber track	(24) Idler
	(25) Carrier roller
	(26) Working light
	(27) Front view camera

[1] BOOM (1)

A boom with a 5-stage telescoping mechanism.

[2] BOOM TELESCOPING CYLINDER (2)

A telescoping cylinder built into the boom.

[3] BOOM DERRICK CYLINDER (3)

A cylinder for lifting the main boom.

[4] WINCH (4)

A device for winding and unwinding winch wire, composed of a motor and drum.

For operational methods for the winch, see “5.2.18 HOOK HOISTING UP/DOWN OPERATION.”

[5] POST (5)

A frame of the slewing part on which the working machine is mounted.

[6] WORKING STATUS LAMP (6)

Red, yellow and green lamps light up according to the operational status of the machine.

Blue lamp lights up when communication is established with the radio controller.

**[7] MAIN CONTROLLER (TTC540) (18),
SUB CONTROLLER (TTC30X) (7)**

This is a machine's controller.

For more information, see “6.10 CONTROLLERS”

**[8] OUTRIGGER GROUNDING CYLINDER
(8), EXTENSION CYLINDER (9),
OUTRIGGER (10)**

Four devices to maintain the vehicle body level and stabilize.

For more information on how to set the outriggers in place, see “5.2.13 OUTRIGGER SETTING”. For information on how to stow the outriggers, see “5.2.24 OUTRIGGER STOWING OPERATION.”

[9] SLEWING DEVICE (11)

A device to slew the crane.

**[10] TRAVEL MOTOR AND SPROCKET (22),
TRACK ROLLER (23), IDLER (24),
CARRIER ROLLER (25)**

Travel device for travelling.

[11] TRAVEL CONTROL (13)

A part for travel control of the machine.

For operation method of travelling, see “5.2.5 TRAVELLING POSTURE” to “5.2.8 DIRECTIONAL CONTROLS.”

[12] RUBBER TRACKS (12)

Rubber tracks for travelling.

For adjusting rubber track tension, see “6.12.1.3 [1] CHECK / ADJUST RUBBER TRACK TENSION.”

[13] CRANE CONTROL (14)

A part for controlling the crane.

[14] OPERATION SEAT (15)

The spot where the operator sits.

For more information, see “4.1.10 OPERATION SEAT.”

[15] INSTRUMENT PANEL (16)

Features various operation switches and monitors.

For more information, see “4.1.5 INSTRUMENT PANEL SECTIONS”.

[16] HOOK BLOCK (17)

A hook block to hoist the load.

[17] HYDRAULIC OIL TANK (19)

A tank for putting hydraulic oil in to operate the hydraulic oil equipment.

[18] FUEL TANK (20)

A tank for putting fuel in to operate the engine.

[19] OVERWINDING DETECTOR (21)

A safety device to prevent the overwinding of the winch wire.

For more information on the device, see “4.1.9.2 [5] OVERWINDING DETECTOR.”

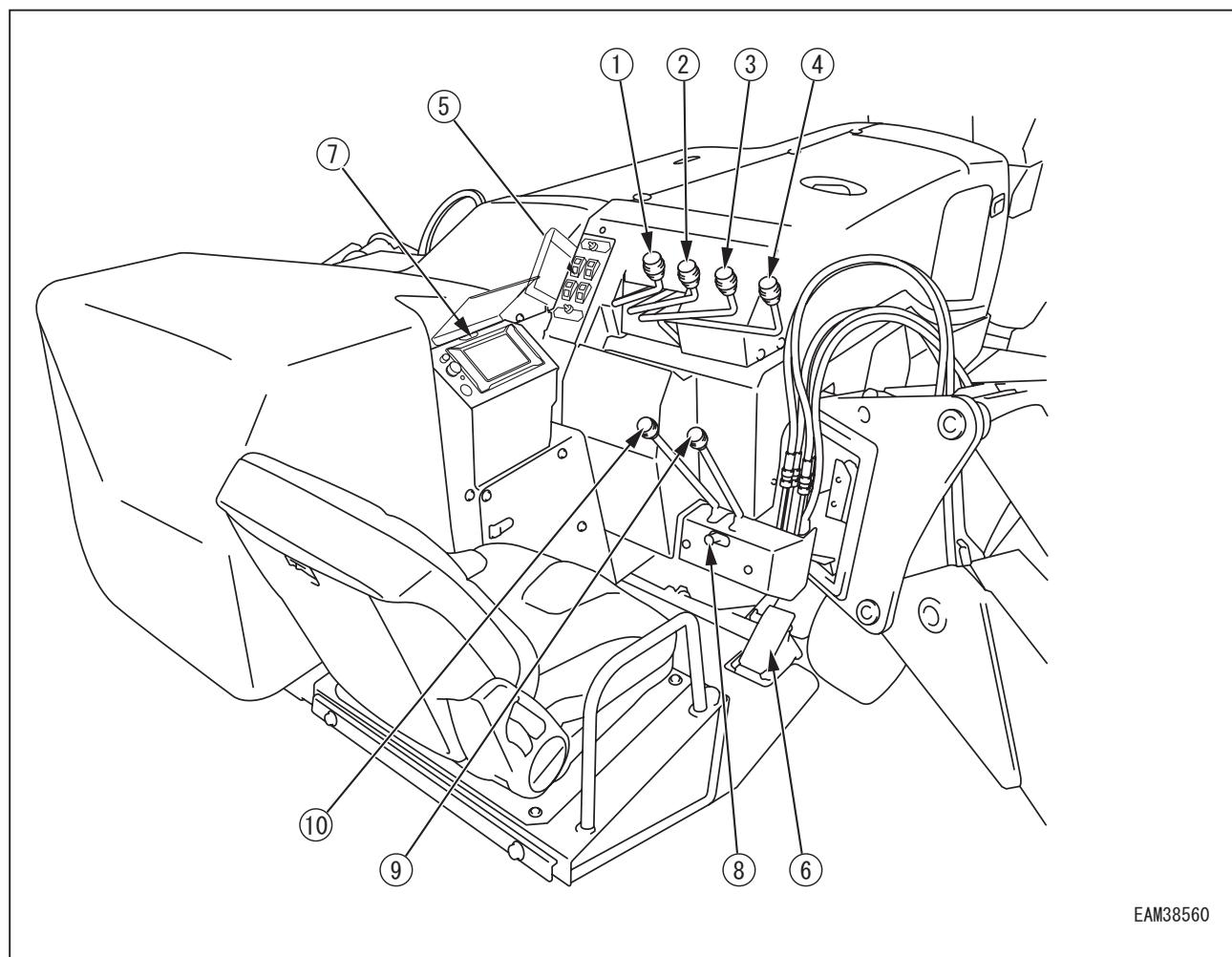
[20] WORKING LIGHT (26)

A working light to light up the front.

[21] FRONT VIEW CAMERA (27)

A camera to display a front view.

4.1.2 TRAVEL AND CRANE CONTROLS

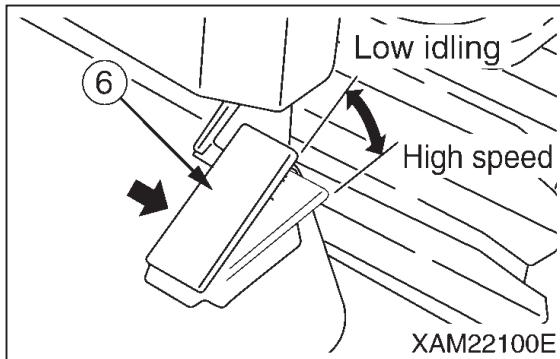


(1) Slewing lever	(6) Acceleration pedal
(2) Boom telescoping lever	(7) Instrument panel
(3) Winch lever	(8) Travelling lock lever
(4) Boom derricking lever	(9) Right travelling lever
(5) Outrigger operation panel	(10) Left travelling lever

[1] ACCELERATION PEDAL (6)

Use the pedal to adjust the engine speed or output.

- Low idling : Release your foot from the pedal.
- Full speed : Press down fully on the acceleration pedal.

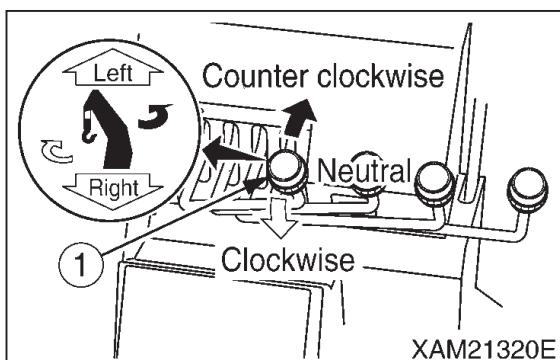


☞ Press down on the acceleration pedal to the position necessary for the work.

[2] SLEWING LEVER (1)

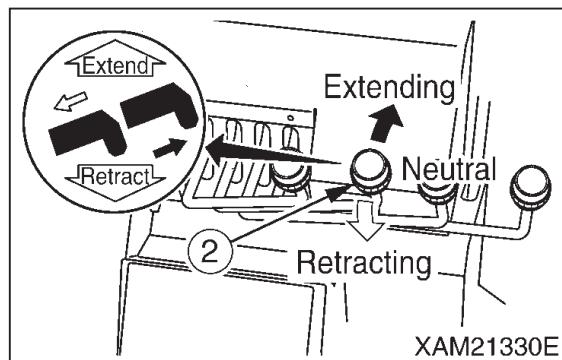
Use the lever to slew the crane boom and post.

- Slew counterclockwise (left):
Press the lever forward (Left).
- Neutral:
Release your hand from the lever.
The lever returns to the "Neutral" position and the slewing stops.
- Slew clockwise (right):
Pull the lever toward you (Right).

**[3] BOOM TELESCOPING LEVER (2)**

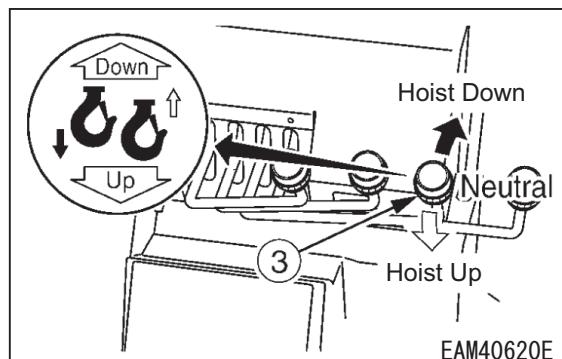
Use this lever to telescoping the crane boom.

- Extend:
Push the lever forward (Extend).
- Neutral:
Release your hand from the lever. The lever returns to the "Neutral" position and the boom telescoping stops.
- Retract:
Pull the lever toward you (Retract).

**[4] WINCH LEVER (3)**

Use this lever to hoist up/down the hook block of the crane.

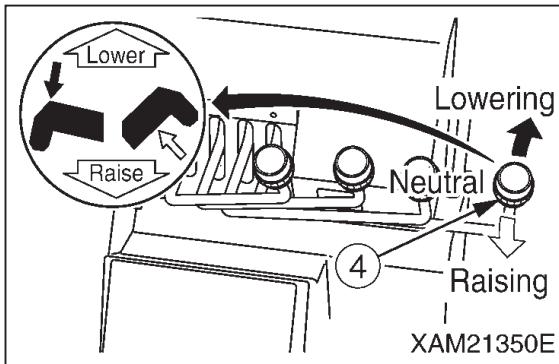
- Down:
Push the lever forward (Down).
- Neutral:
Release your hand from the lever.
The lever returns to the "Neutral" position and the machine automatically brakes. The hoisting up/down of the hook block stops.
- Up:
Pull the lever toward you (Up).



[5] BOOM DERRICKING LEVER (4)

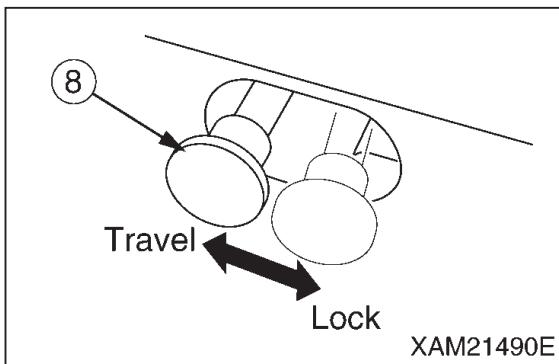
Use this lever to derrick the crane boom.

- Lower:
Push the lever forward (Lower).
- Neutral:
Release your hand from the lever. The lever returns to the “Neutral” position and the boom derrick stops.
- Raise:
Pull the lever toward you (Raise).

**[6] TRAVELLING LOCK LEVER (8)**

Use this lever to “lock” the travelling levers.

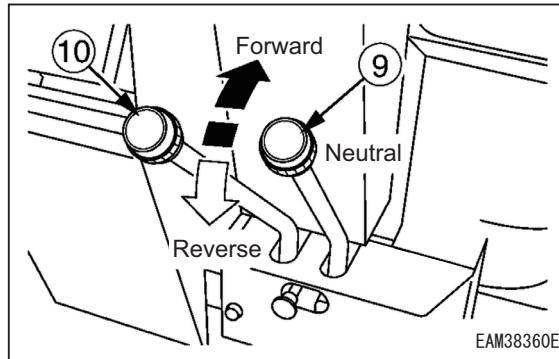
- Lock: Push the lever to the right.
- Travel: Push the lever to the left.



☞ Operate the travelling lock lever while the left and right travelling levers are at the “Neutral” position.

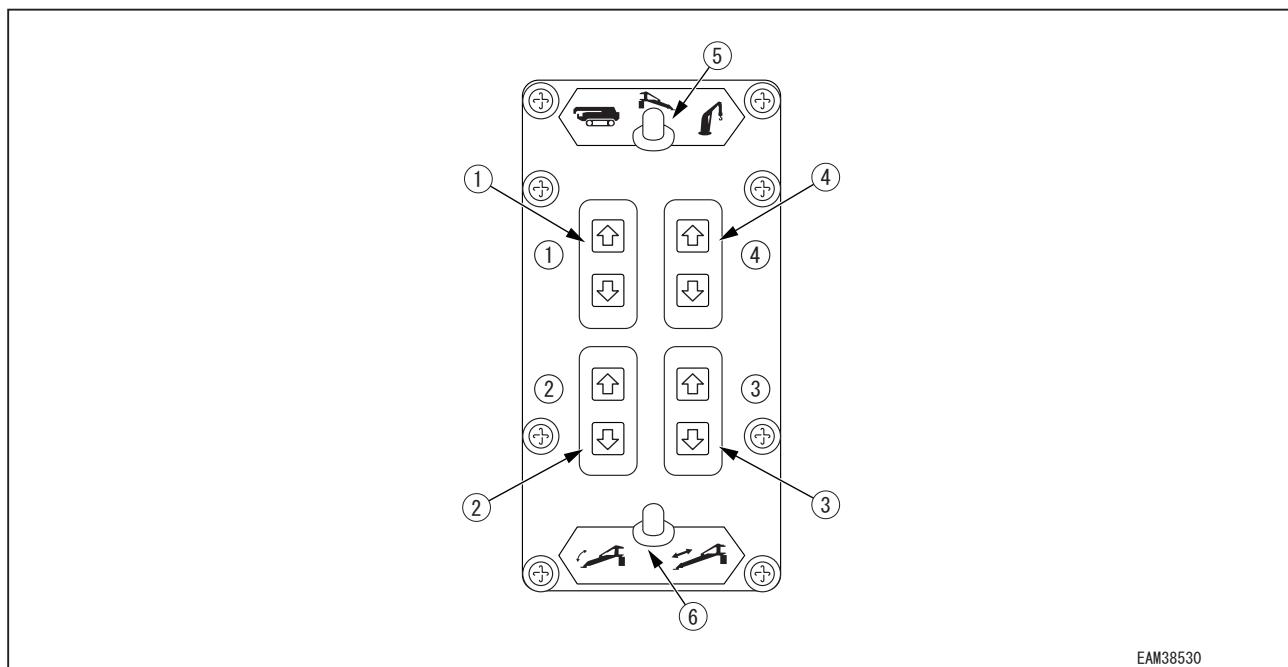
[7] LEFT/RIGHT TRAVELLING LEVER (9), (10)

Use these levers to move the machine forward/backward, stop, slew, and to adjust the travelling speed.



- Forward:
Push the left and right levers forward at the same time.
- Neutral:
Release your hands from left and right levers at the same time. The levers return to the “Neutral” position and the machine automatically brakes and stops at that position.
- Backward:
Pull the left and right levers toward you at the same time.
- Left turn:
Release your hand from the left lever and operate the right lever forward or backward.
- Right turn:
Release your hand from the right lever and operate the left lever forward or backward.
- Spin turn:
Operate the left and right levers to the opposite direction. The left and right crawlers turn to the opposite direction, allowing you to make the spin turn.

4.1.3 OUTRIGGER OPERATION PANEL



EAM38530

(1) Outrigger [1] switch	(5) Work selector switch (travel/outrigger/crane)
(2) Outrigger [2] switch	(6) Work selector switch (outrigger grounding/extension)
(3) Outrigger [3] switch	
(4) Outrigger [4] switch	

[1] WORK SELECTOR SWITCH (TRAVEL/OUTRIGGER/CRANE)(5)

⚠ WARNING

- When operating the work selector switch (travel/outrigger/crane) to the “Travel” position, be sure to stow the crane and put the machine in the “travelling posture”. Operating the machine not in the “travelling posture” can overturn the machine, resulting in serious accidents.
- Be sure to operate the travelling lock lever to the “LOCK” position before outrigger or crane operation. Note that if the travelling lock lever is not at the “LOCK” position, you can still travel the machine even if the work selector switch (travel/outrigger/crane) is operated to the “Outrigger” or “Crane” position. Be careful not to let your hand or body touch the travelling levers. The machine may move, causing serious accidents.

- Be sure to set all the outriggers when turning the work selector switch (travel/outrigger/crane) to the “Crane” position to perform the crane operation. Inappropriate setting of outriggers will prevent the crane operation because of the outrigger safety device function.
- Always stow the boom when performing the outrigger operation with the work selector switch (travel/outrigger/crane) set to the “Outrigger” position. If the boom is not stowed properly, the outrigger safety device function prevents the outrigger operation from being performed.

Use this switch to switch the work state of the machine (travel/outrigger/crane).

- Travel:

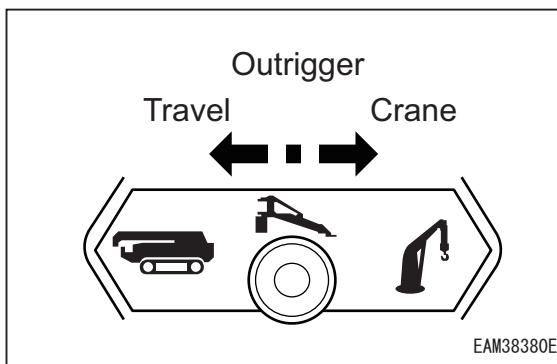
Push the switch to the left. Now you can travel the machine.

- Outrigger:

Push the switch to the centre position. Now you can perform the outrigger operation.

- Crane:

Push the switch to the right. Now you can perform the crane operation.



- Only the travelling operation is active when the work selector switch (travel/outrigger/crane) is at the "Travel" position.
- When the work selector switch (travel/outrigger/crane) is at the "Outrigger" position, all the devices in the table below are active. Be sure to set the travelling lock lever to the "LOCK" position and stow the crane when operating the outriggers. Be careful not to touch the operation levers of the crane.
- When the work selector switch (travel/outrigger/crane) is at the "Crane" position, all the devices except for outrigger operation in the table below are active. Be sure to set the travelling lock lever to the "LOCK" position and set all the outriggers when operating the crane.

☞ The table below shows the relation between the operation position of the work selector switch (travel/outrigger/crane) and permitted operations.

Work Selector Switch (Travel/Outrigger/ Crane) Operation Position	Crane System (A: Active N: Not active)					
	Travelling Operation	Outrigger Operation	Crane Operation	Remote control system		Moment Limiters
				Crane	Outrigger	
Travel	A	N	N	N	N	N
Outrigger	N (Note 1)	A	N	N	A	A
Crane	N (Note 1)	N	A	A	A (Note 2)	A

Note 1: Operating the travelling lock lever to the "LOCK" side restricts the travelling operation.

If the lever is not operated to the "LOCK" side, the machine travels when a travelling lever is operated.

Note 2: The outrigger operation is enabled only when the transmitter of the remote control system is in the "OUTRIGGER mode".

[2] WORK SELECTOR SWITCH (OUTRIGGER GROUNDING/ EXTENSION)(6)

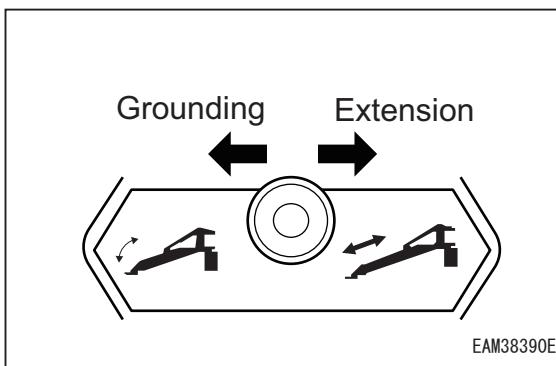
Use this switch to switch the work state of the machine (outrigger grounding/extension).

- Outrigger grounding:

Push the switch to the left. Now you can ground or stow the outriggers.

- Outrigger extension:

Push the switch to the right. Now you can extend or retract the outriggers.



[3] OUTRIGGER SWITCHES (1)(2)(3)(4)

Use these switches to operate the outriggers.

There are four outriggers ([1] to [4]). Each outrigger can be operated individually or all together.

1. In outrigger grounding.

- IN:

Push the switch upward. The outrigger grounding cylinder retracts and you can stow the outrigger.

- Neutral:

Release your finger from the switch. The switch returns to the "Neutral" position and the outrigger grounding cylinder stops telescoping.

- OUT:

Push the switch downward. The outrigger grounding cylinder extends and you can set the outrigger.

2. In outrigger extension.

- IN:

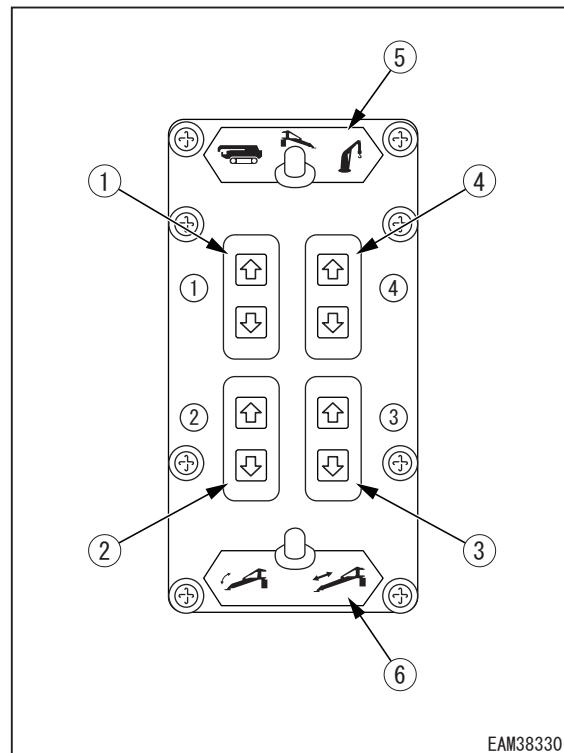
Push the switch upward. The outrigger extension cylinder retracts and you can stow the outrigger inner box.

- Neutral:

Release your finger from the switch. The switch returns to the "Neutral" position and the outrigger extension cylinder stops telescoping.

- OUT:

Push the switch downward. The outrigger extension cylinder extends and you can extend the outrigger.



4.1.4 OUTRIGGER SAFETY DEVICES

4.1.4.1 FUNCTIONS OF OUTRIGGER SAFETY DEVICES

The outrigger safety devices have the interlock functions shown in the table below.

	Interlock Function	Description of Interlock Function
1	Outrigger Interlock	<p>The outrigger is not enabled if the position pin is not inserted properly by rotating the outrigger rotary to extension side (outward) with the boom being stowed (boom fully retracted, boom fully lowered and slewing stowage position).</p> <ul style="list-style-type: none"> • The boom in a fully retracted state is detected by the length sensor. • The boom in a fully lowered state is detected by the angle sensor. • The boom slewing stowage position is detected by the detection switch on the slewing unit detecting whether the boom stops at the slewing stowage position. If an abnormality occurs during operation, check the detection or switch on the slewing unit.
2	Crane Interlock 1	<p>If all four outriggers are not set up (extended and grounded), crane operations (telescoping, hoisting up/down hook, derricking, and slewing) cannot be performed even if the mode is switched from outrigger mode to crane mode.</p> <p>The outrigger set up status is detected as follows.</p> <ul style="list-style-type: none"> • Install a detection switch at the position pin section of the outrigger rotary to detect the insertion of the position pin into the extension position. • Install a detection switch inside the outrigger inner box to detect if the outrigger foot is seated properly through the detection pin installed between the tip of the inner box and the outrigger foot.
3	Crane Interlock 2	<ul style="list-style-type: none"> • If “2 or more adjacent outriggers are lifted” is detected while operating the crane, crane operations will be partially restricted (preventing operations other than retraction and lowering). In this case, the Working Status Lamp flashes in red, and the alarm buzzer sounds. • If the “2 or more adjacent outriggers are lifted” status clears when the lever is returned to the NEUTRAL position, normal crane operations are enabled. • If the lifted outrigger status is not cleared even when the lever is returned to the NEUTRAL position, the boom must be retracted first and the outriggers reset.

⚠ DANGER

If 2 or more adjacent outriggers are lifted, operate the crane on the safe side (retracting/hoisting down) and ground the outriggers to clear the status.

If it is not possible to clear the situation by operating on the safe side, it is necessary to use the override switch to clear the status.

Comply with all precautions described in “4.1.9.6 MOMENT LIMITER OVERRIDE SWITCH” when using the Override switch.

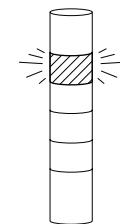
IMPORTANT

- Set the outriggers in the set up status and operate the work selector switch (travel/outrigger/crane) in the outrigger operation panel to the “Crane” position to enable the crane operation.
When the detection condition for setting one of the four outriggers (see the item 2 in the table above) is no more fulfilled, the working status lamp (red) flashes.
- Stow the crane and operate the work selector switch (travel/outrigger/crane) on the outrigger operation panel to the “Outrigger” position to enable the outrigger setting and extension operations.
Please contact us or our sales service agency.
- If the crane operation is not enabled after operating the work selector switch (travel/outrigger/crane) on the outrigger operation panel to the “Crane” position even after the outrigger is being extended and set, there may be faulty adjustment or failure in the outrigger safety device.
Please contact us or our sales service agency.

**4.1.4.2 OUTRIGGER UN-SET
WARNING**

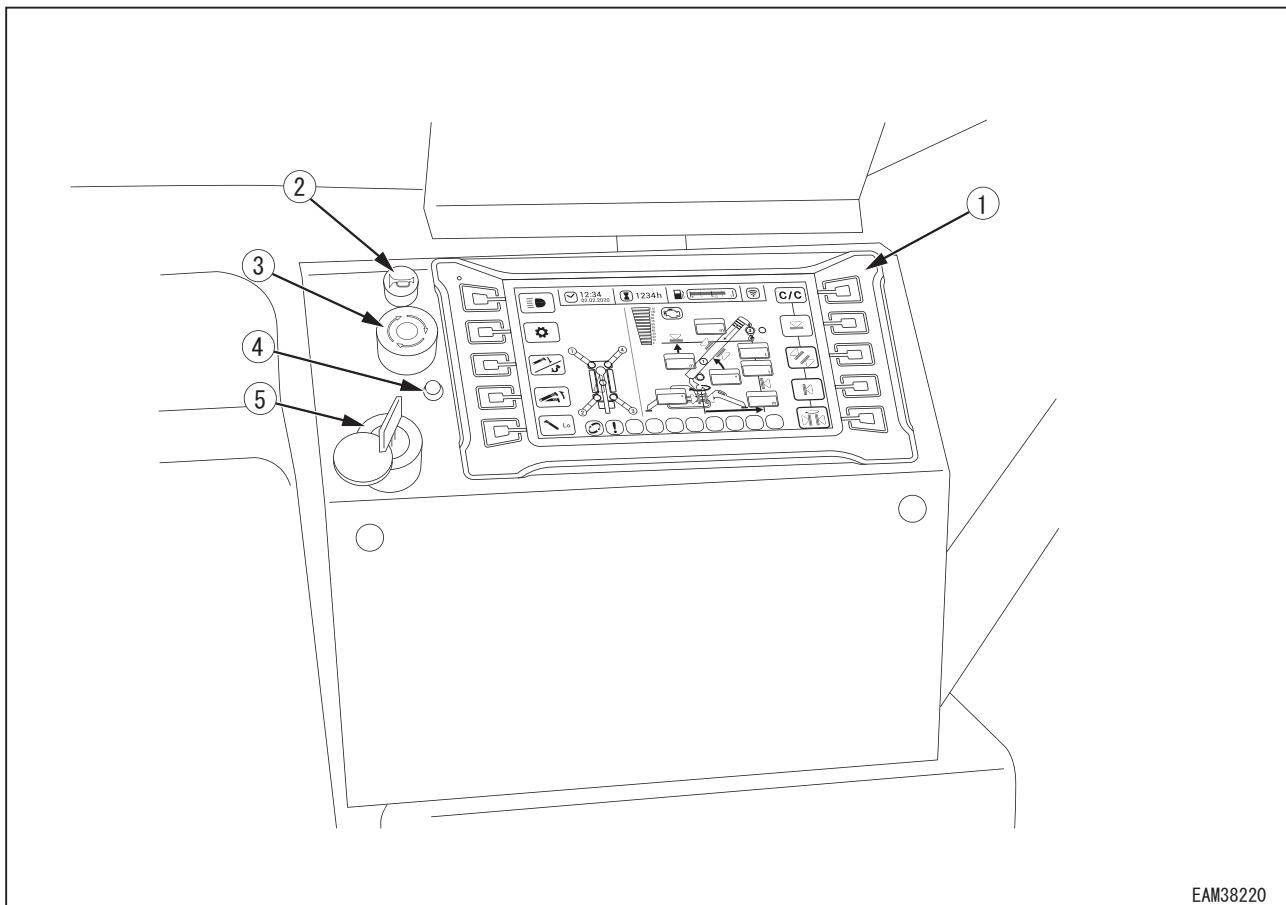
If any of the four outriggers is not properly set, the working status lamp (red) flashes.

☞ Even if all four outriggers are set up, if the machine tilt is large, then the working status lamp flashes red. In this instance, it is not possible to set the mode to the crane mode.



EAM38050

4.1.5 INSTRUMENT PANEL SECTIONS



EAM38220

(1) Monitor	(4) Pre-heating lamp
(2) Horn switch	(5) Starter switch
(3) Engine emergency stop switch (EMO)	

4.1.5.1 SWITCHES

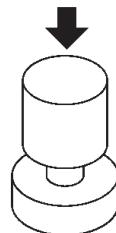
[1] MONITOR (1)

This is a display device for displaying the machine's status.

[2] HORN SWITCH (2)

Use this switch to sound the horn.

- Honking the horn: Press the switch.



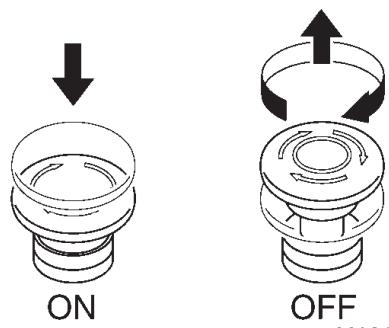
XAM04770

- ☞ The horn will stop when you release your finger from the switch.

[3] ENGINE EMERGENCY STOP SWITCH (EMO)(3)

Use this switch in case of an error in the machine to stop the machine for emergency.

- ON : Press the switch. The engine stops.
- OFF : Turn the switch clockwise (direction of the arrow in the figure). The switch returns to the original position.

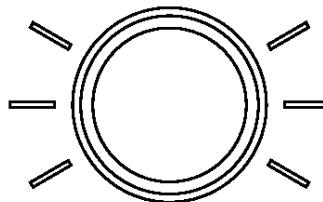


XAM21450

- ☞ When restarting the engine after overriding, be sure to turn the engine emergency stop switch (EMO) to the "OFF" position before starting the engine.

[4] PRE-HEATING LAMP (4)

When the starter switch has been turned to the ON position, the lamp lights. Several seconds later, the lamp goes out to notify the user that the pre-heating has been completed.



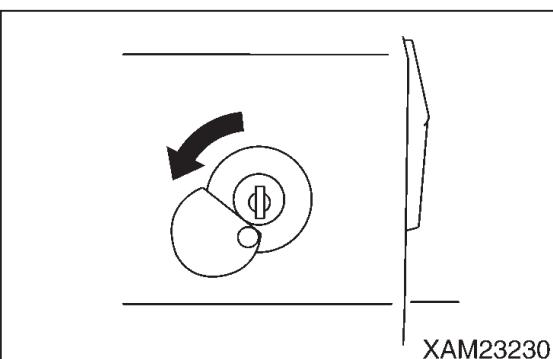
EAM39340

- ☞ The time the lamp is lit varies depending on the temperature.

[5] STARTER SWITCH (5)

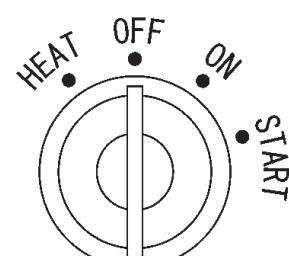
⚠ CAUTION

Always turn the starter switch to the "OFF" position after completing the work.



XAM23230

- ☞ When inserting the key for the starter switch, slide the cover to the right so that you can see the keyhole of the switch, and then insert the key.



XAM21690

Use this switch to start and stop the engine.

- HEAT:

Turn the key to this position when starting the engine in the cold weather.

- OFF:

You can insert/remove the key at this position. All the switches in the electrical system are turned off and the engine stops.

- ON:

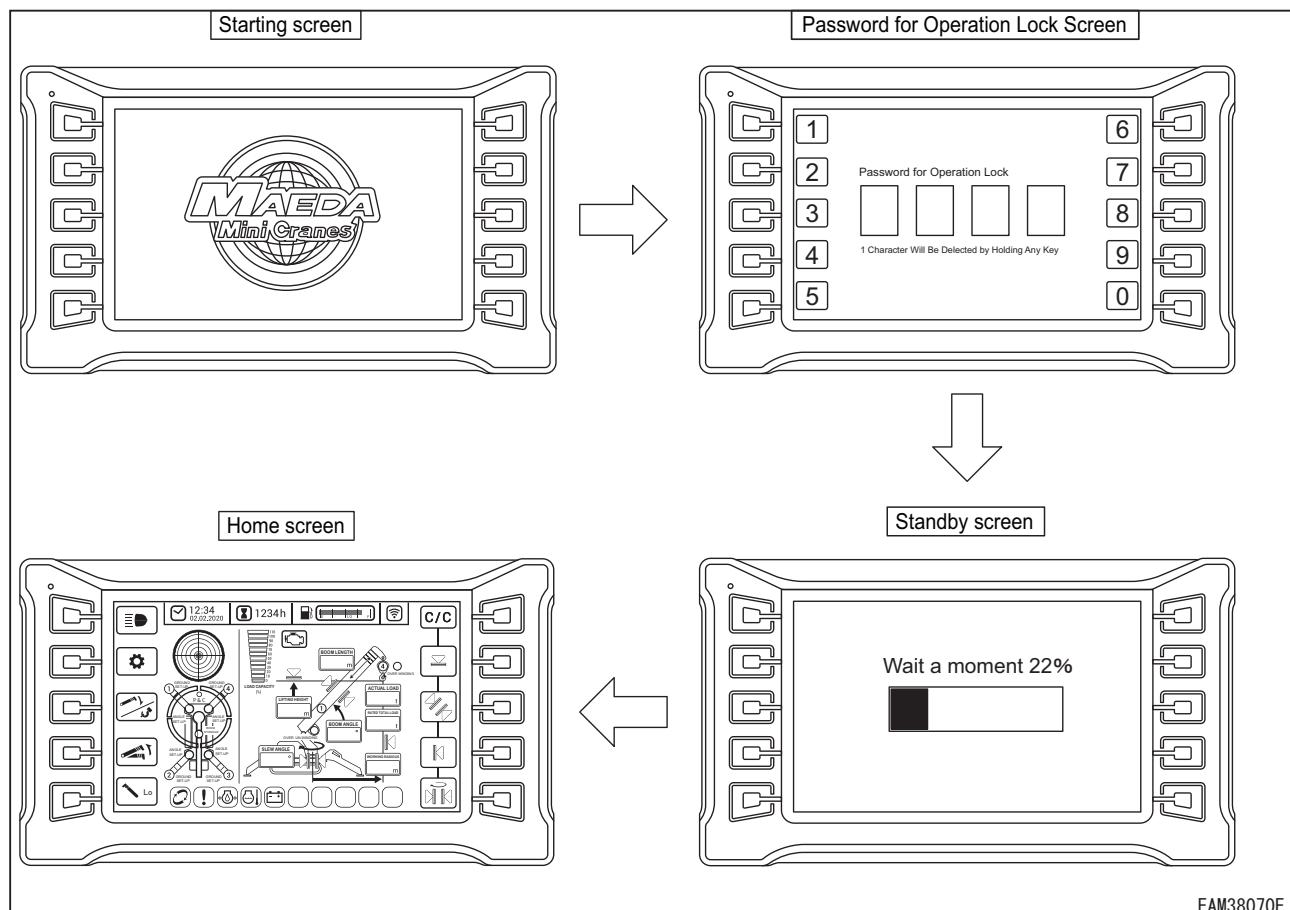
Electricity runs into all the circuits.

- START:

When the engine has started, release your hand from the key. The key automatically returns to the “ON” position.

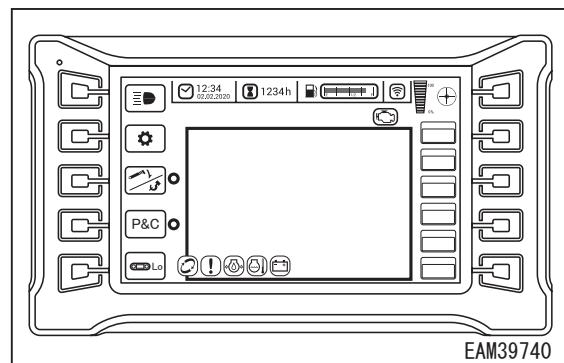
4.1.6 MONITOR

4.1.6.1 START SCREEN

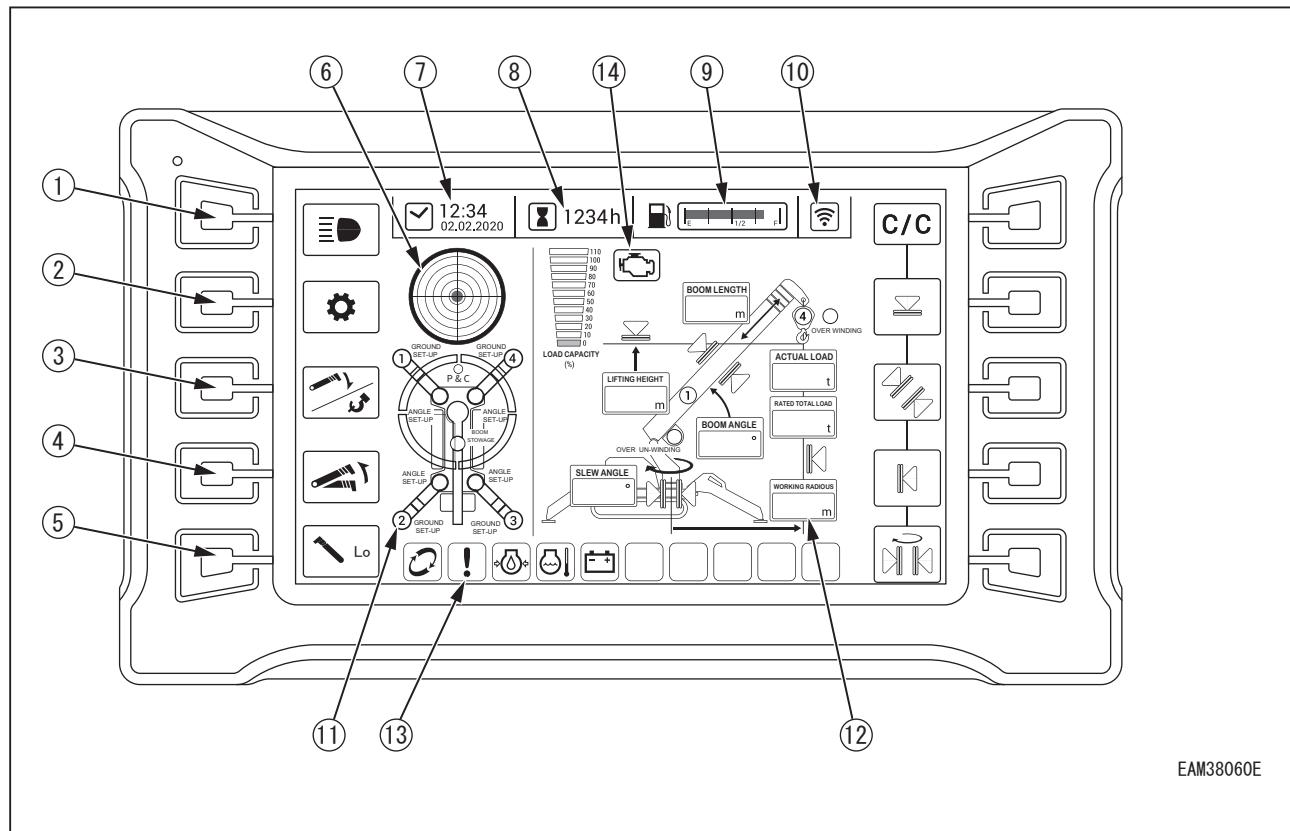


- When starting the machine, the battery voltage may suddenly fall depending on the temperature and battery state. In that case, the monitor display may temporarily turn off, but this is not a defect.
- When the starter switch is turned to the ON position, the start screen is displayed.
- After the start screen is displayed, if the operation lock is set with password protection, the operation lock password screen is displayed.
- Next, the standby screen is displayed and the display switches to the home screen.

- When the work selector switch (travel/outrigger/crane) is in travel position, the home screen switches to the travel screen. Only travel operations are possible on this screen. The crane and outriggers cannot be operated.



4.1.6.2 HOME SCREEN

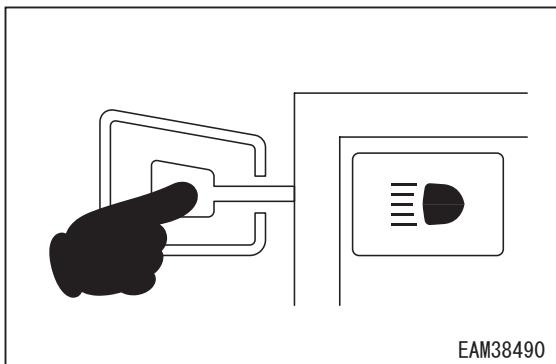


- (1) Working light ON/OFF switch
- (2) User mode switch
- (3) Hook stowage/boom stowage switch
- (4) Boom lift bypass switch
- (5) Crane high-speed switch
- (6) Level gauge
- (7) Time display
- (8) Hour meter display
- (9) Fuel gauge
- (10) Radio remote control system connection display
- (11) Outrigger status display
- (12) Moment limiter status display
- (13) Warning display
- (14) Engine / electric motor drive display (engine and electric specification)

[1] WORKING LIGHT ON/OFF SWITCH (1)

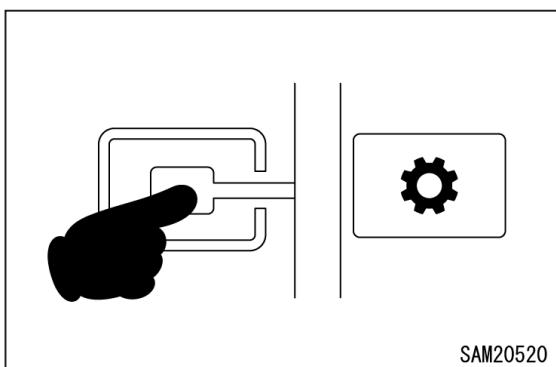
Used to turn on the working light.

- Yellow light: the working light is “ON.”
- White light: the working light is “OFF.”

**[2] USER MODE SWITCH (2)**

Used for user settings.

Press the switch to switch to user mode.

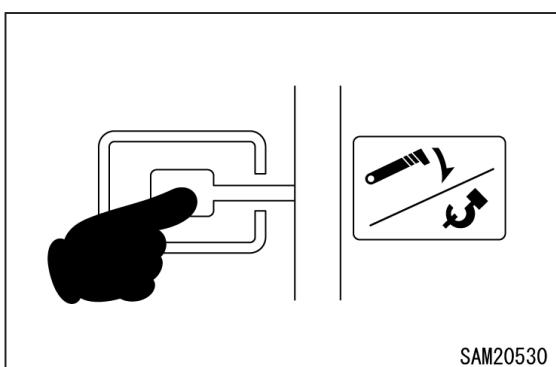


For details of the user mode, refer to section “4.1.6.3 USER MODE.”

[3] HOOK STOWAGE/BOOM STOWAGE SWITCH (3)

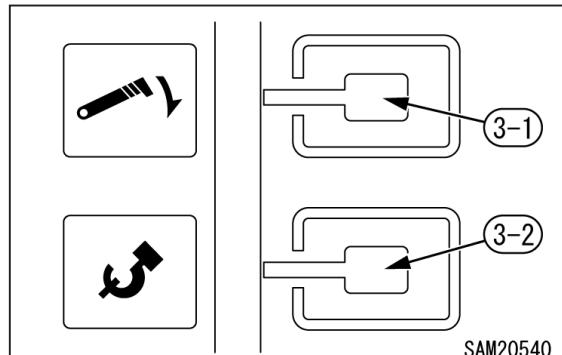
Used when stowing the hook or the boom.

Press the switch to display the selection for hook stowage and boom stowage.



The hook or boom can be stowed by pressing each switch.

- Boom stowage switch (3-1)
- Hook stowage switch (3-2)

**[4] BOOM STOWAGE SWITCH (3-1)
HOOK STOWAGE SWITCH (3-2)**

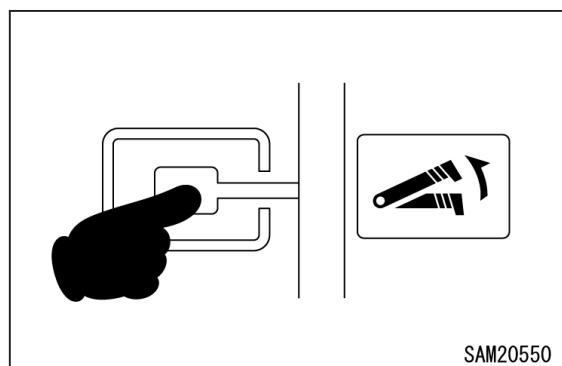
For more information on stowage procedures, see “5.2.23 CRANE STOWING OPERATION.”

[5] BOOM LIFT BYPASS SWITCH (4)

Used to lift the boom in overload state. Lifting is possible only while the switch is pressed down.

For more information on the operation of Boom Lift Bypass Switch, see “4.1.9.3 [2] RECOVERY OPERATION AFTER AUTO STOP.”

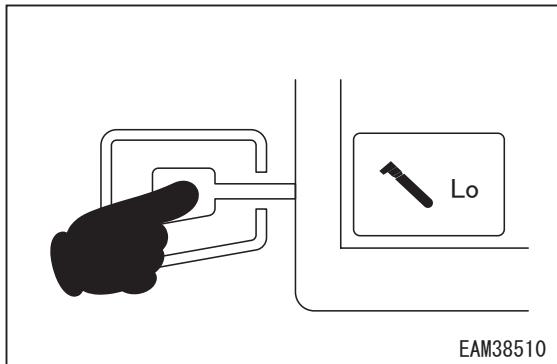
☞ For more information on how to use the switch, see “4.1.7.1 HOME SCREEN.”



[6] CRANE HIGH-SPEED SWITCH (5)

Use this switch to change the operating speed of the crane during the crane operation.

- Hi : The crane operating speed increases.
- Lo : The crane operating speed returns to normal.

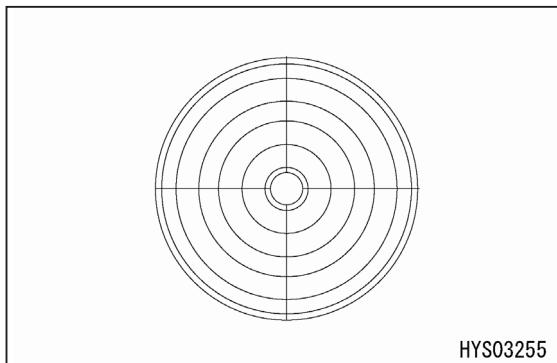


☞ Always set the work selector switch (Travel, Outrigger, Crane) on the outrigger operation panel to the “Crane” position.

[7] LEVEL GAUGE (6)

Displays the tilt status of the machine.

The position of the yellow bubble indicates the direction in which the machine is tilting.

**[8] TIME DISPLAY (7)**

Displays the time set.

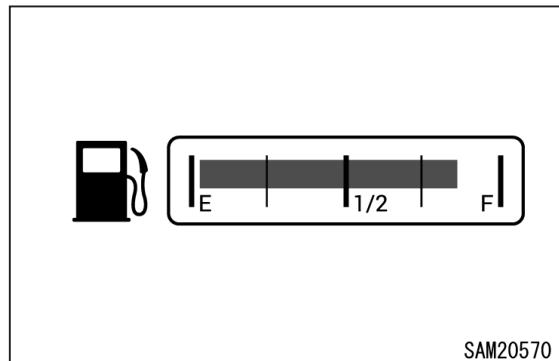
There may be an offset in the time displayed, depending on machine usage conditions. If so, reset as described in “4.1.6.3 [7] TIME SETTING (2-7).”

[9] HOUR METER DISPLAY (8)

Displays cumulative hours of operation.

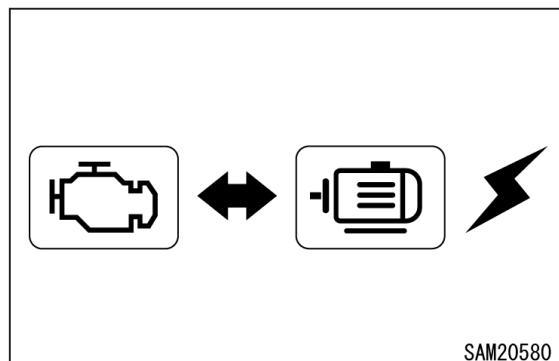
[10] FUEL GAUGE (9)

Displays the quantity of fuel in the fuel tank.

**[11] ENGINE/ELECTRIC MOTOR DRIVE DISPLAY (14) (ENGINE AND ELECTRIC SPECIFICATION)**

Displays the current drive condition of the machine.

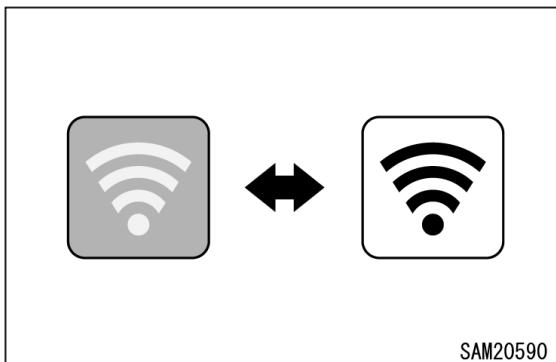
- Engine : engine mode
- Electric motor : electric drive mode



[12] RADIO REMOTE CONTROL SYSTEM CONNECTION DISPLAY (10)

Displays the current radio remote control system connection status.

- On: The radio remote control system is connected.
- Off: The radio remote control system is not connected.

**[13] OUTRIGGER STATUS DISPLAY (11)**

Displays the current outrigger status.

For more information on display content, see
“4.1.6.6 OUTRIGGER STATUS DISPLAY SCREEN.”

[14] MOMENT LIMITER STATUS DISPLAY (12)

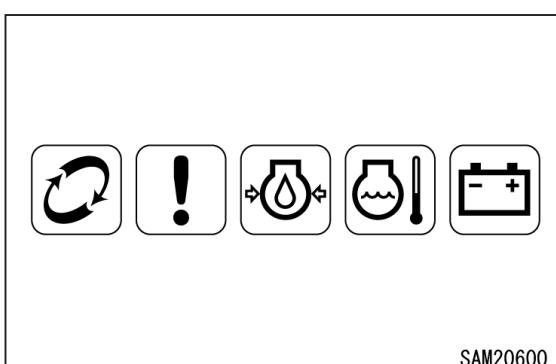
Displays the current moment limiter status.

For more information on display content, see
“4.1.9.4 MOMENT LIMITER DISPLAY.”

[15] WARNING DISPLAY (13)

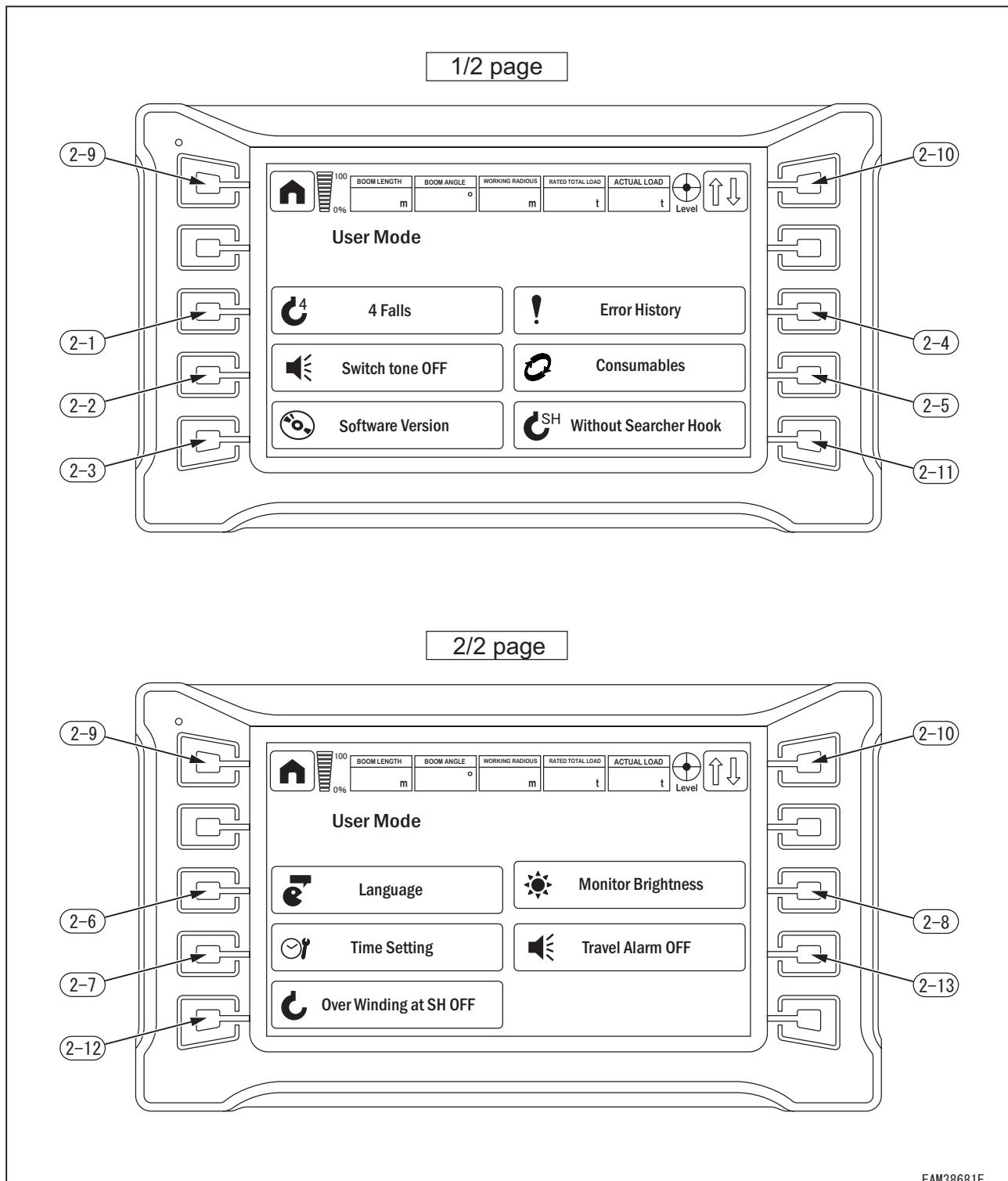
Displays lit up warnings.

For more information on the display content, see “4.1.6.4 WARNING DISPLAY.”



4.1.6.3 USER MODE

When the User Mode Switch is pressed on the Home Screen, the User Mode is displayed.



- (2-1) Number of falls change
- (2-2) Switch tone ON/OFF change
- (2-3) Software version check
- (2-4) Error history display
- (2-5) Consumables display
- (2-6) Language change
- (2-7) Time setting

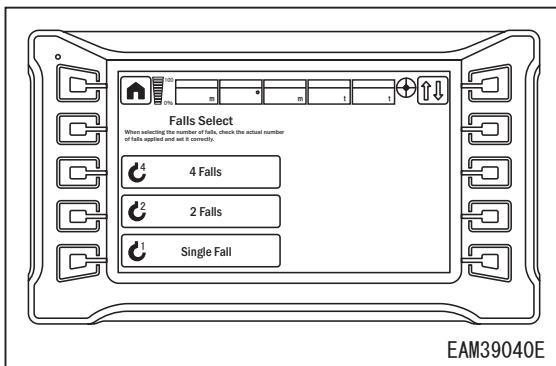
- (2-8) Monitor brightness adjustment
- (2-9) Home switch
- (2-10) Display page setting
- (2-11) Searcher hook change
- (2-12) Overwinding SH ON/OFF setting
- (2-13) Travel alarm ON/OFF change

[1] NUMBER OF FALLS CHANGE (2-1)

⚠ WARNING

When entering the number of falls, hook, verify the actually used number of falls, hook, and make sure to set up correctly. Entering incorrect number of falls, hook, may prevent issuance of the prediction alarms and boom auto-stop even when the overload is near happening, and thus may result in crane damage or machine trip that may result in serious accidents.

Number of falls can be changed.

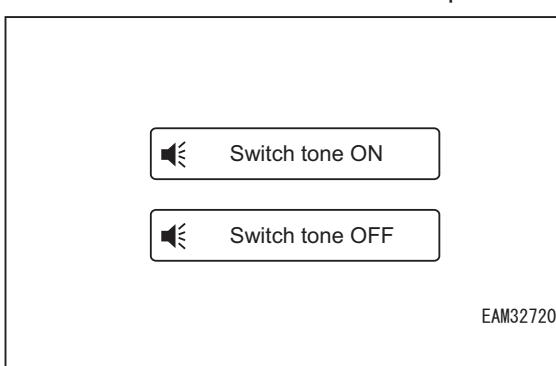


- ☞ If the actual load is 0.3t or more, the number of falls cannot be changed. If the number of falls cannot be changed, the actual load display will flash to notify you.

[2] SWITCH TONE ON/OFF CHANGE (2-2)

When the switch is pressed, switch tone can be turned OFF and ON.

- OFF:
No tone is heard when switches are operated.
- ON:
Tone is heard when switches are operated.



[3] SOFTWARE VERSION CHECK (2-3)

The version of the controller software and monitor can be checked.

Software Version

Display Software Version

00.0.0.00.00

Controller Software Version

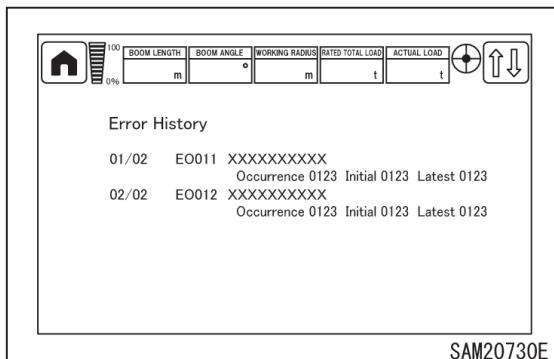
00.0.0.00.00

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[4] ERROR HISTORY DISPLAY (2-4)

Allows review of current or past errors.

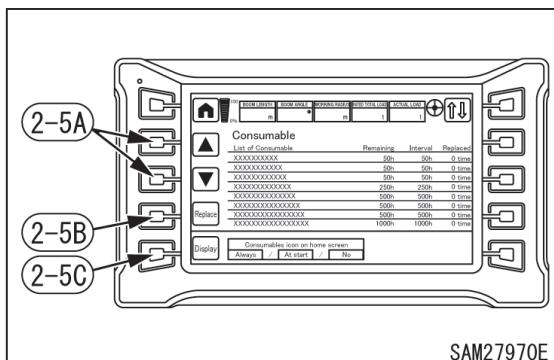
- Red text: Current errors
- White text: Past errors



For more information on error codes, see “6.23 TROUBLESHOOTING FOR REMOTE CONTROL SYSTEM.”

[5] CONSUMABLES DISPLAY (2-5)

Lists consumables and indicates the time until the next scheduled replacement.



For more information on consumables list, see “6.5 CONSUMABLES.”

If a consumable has been replaced, use the ▲ or ▼ adjuster switches (2-5A) to select the consumable replaced. Once a consumable has been selected, hold down the replacement switch (2-5B) to update the replacement time. Updating increments the number of replacements by 1 and resets the time remaining.

If "Always" or "At start" is selected for the consumable icon display selection (2-5C), yellow text and a white icon will appear on the Home screen if the remaining time is 30 h or 3 days, while red text and a red icon will appear on the Home screen when the remaining time is 0 h or 0 days.

Replace consumable promptly. Continued use past the recommended replacement date may be dangerous and harm the machine.

☞ We recommend setting the consumable icon display selection (2-5C) to "Always."

- Always:

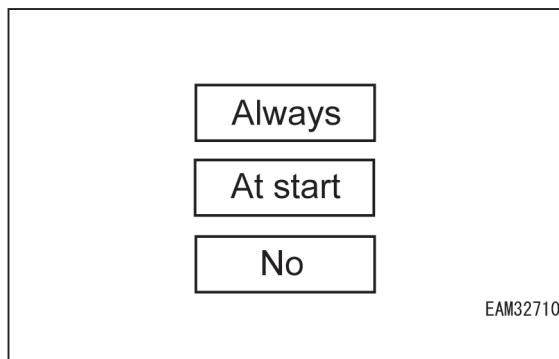
Consumable icons are constantly displayed on the Home screen if the replacement time is approaching or has been exceeded.

- At start:

Consumable icons are displayed only for 30 seconds after displaying the Home screen if the replacement time is approaching or has been exceeded.

- No:

Consumable icons are not displayed on the Home screen, even if the replacement time is approaching or has been exceeded.



[6] LANGUAGE CHANGE (2-6)

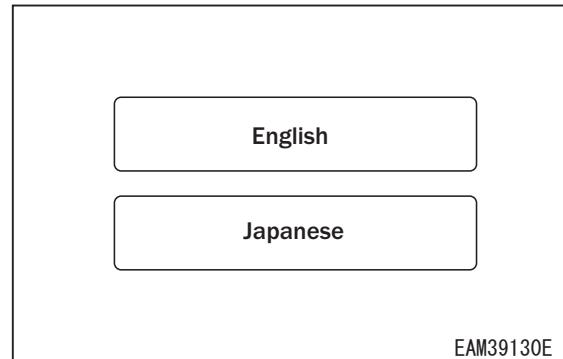
The display language can be changed and reset.

- English:

Switches the display language to English.

- Japanese:

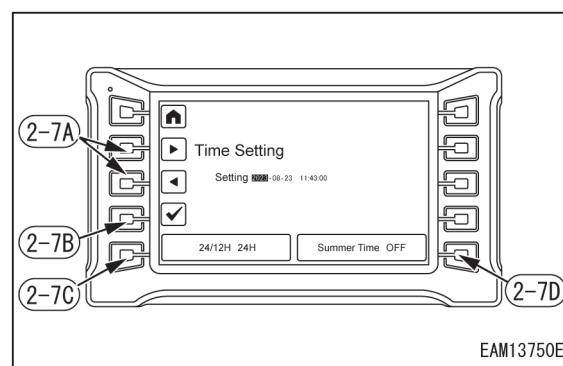
Switches the display language to Japanese.



EAM39130E

[7] TIME SETTING (2-7)

The time setting, 24/12 hour display and summer time ON/OFF can be changed.



1. Setting the time

Select the date and time desired to be changed with ▲ or ▼ of the adjustment switch (2-7A) and press the check mark (2-7B). (The part whose background is white is selected.)

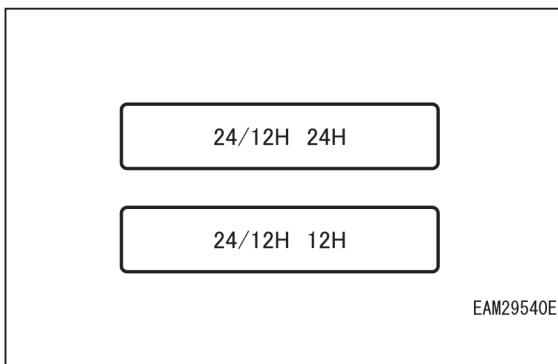
When the word colour turns red, editing becomes possible. Make adjustments with ▲ or ▼ of the adjustment switch in this condition.

When the check mark is finally pressed, editing is completed.



2. 24/12 Hour display change

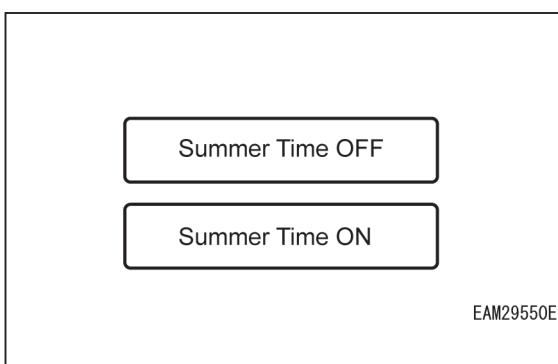
When the switch (2-7C) is pressed, time display can be changed to either 24 hour display or 12 hour display.



3. Summer time ON/OFF

When the switch (2-7D) is pressed, ON or OFF of summer time can be selected.

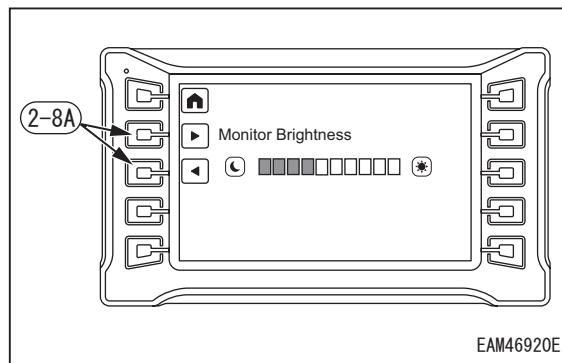
- Summer Time OFF:
Originally set time is displayed.
- Summer Time ON:
Time display is moved up by one hour.



[8] MONITOR BRIGHTNESS ADJUSTMENT (2-8)

The monitor brightness can be adjusted.

Make adjustments with \blacktriangleleft or \triangleright of adjustment switch(2-8A).



[9] HOME SWITCH (2-9)

- Short press : Returns one page.
- Long press : Returns to home page.

☞ The function of the Home switch is the same for confirmation and setting screens.

[10] DISPLAY PAGE CHANGE (2-10)

Each time the switch is pressed, the page changes.

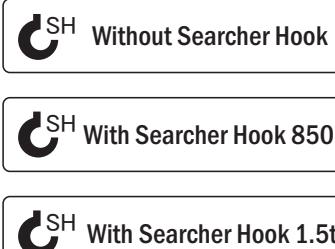
☞ The function of the Display Page Change switch is the same for confirmation and setting screens if they cover more than one page.

[11] SEARCHER HOOK SETTING (2-11)

⚠ WARNING

Make sure that the searcher hook setting matches the actual conditions. If set incorrectly, a serious accident could occur.

Use this switch to switch the searcher hook setting.



EAM43930E

For more information on the overwinding SH ON/OFF setting, see “4.1.7.2 [2] SEARCHER HOOK SETTING.”

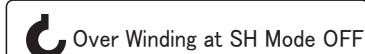
[12] OVERWINDING SH ON/OFF CHANGE (2-12)

⚠ WARNING

Overwinding “OFF” should only be selected when the hook block is removed and the searcher hook is being used. If “OFF” is selected when the searcher hook is used, and the hook block is installed, the overwinding prevention device will not operate, and there is a danger that the hook block will fall.

The overwinding prevention device function

ON/OFF when using searcher hook.



SAM21960E

- ☞ For more information on the overwinding SH ON/OFF setting, see “4.1.7.2 [3] OVERWINDING SH ON/OFF SETTING.”
- ☞ The searcher hook is abbreviated in some places as ‘SH’.

[13] TRAVEL ALARM ON/OFF CHANGE (2-13)

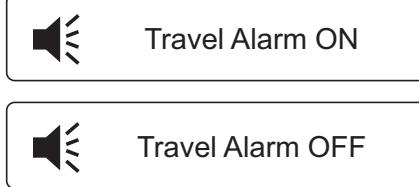
Allows the travel alarm to be switched ON or OFF.

• ON:

The alarm sounds when the machine is travelling.

• OFF:

The alarm does not sound when the machine is travelling.



SAM27680E

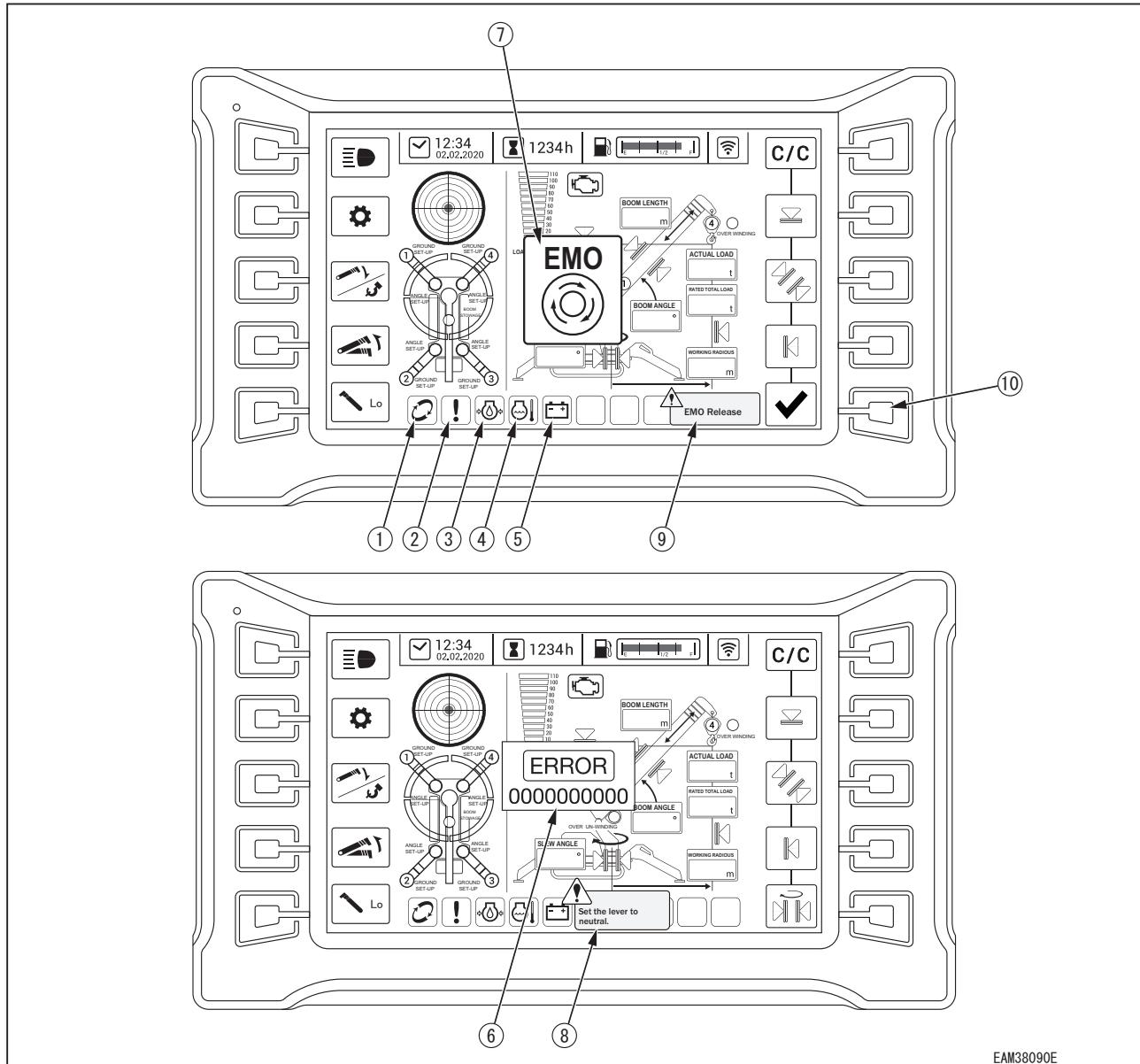
- ☞ The switch is only displayed if “With Travel Alarm” is selected in the service mode screen.

4.1.6.4 WARNING DISPLAY

⚠ CAUTION

If the warning display lights up in red, immediately stop the operation and stop the machine, or set it to low idle. Then, immediately inspect the applicable part and take action for it.

If a fault occurs in the machine, the warning display on the monitor lights up in red, and an alarm buzzer sounds at the same time.



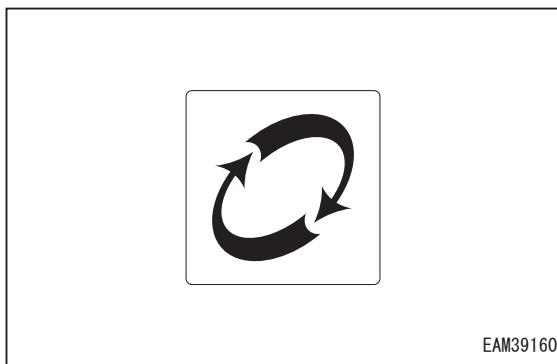
(1) Consumables display	(7) Emergency stop display
(2) Abnormality display (abnormality detected)	(8) Neutral lever position abnormality display
(3) Engine oil pressure monitor	(9) Emergency stop reset guide display
(4) Engine water temperature monitor	(10) Emergency stop reset switch
(5) Battery charge monitor	
(6) Error code display	

- ☞ If warning and/or error code is displayed, check the warning content and error content.
- If an error code is displayed, see "6.23 TROUBLESHOOTING FOR REMOTE CONTROL SYSTEM" and correct the problem.

[1] CONSUMABLES DISPLAY (1)

A warning is displayed if the replacement time for consumables is approaching or has been exceeded.

- Yellow:
The replacement time for consumables is approaching.
- Red:
The replacement time for consumables has been exceeded.



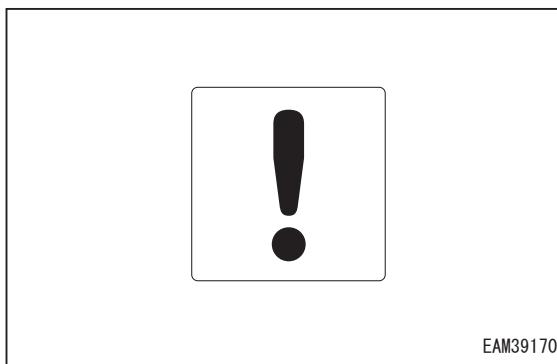
If a warning is displayed, replace the relevant consumable and take the appropriate action.

See "4.1.6.3 [5] CONSUMABLES DISPLAY (2-5)."

[2] ABNORMALITY DISPLAY (ABNORMALITY DETECTED) (2)

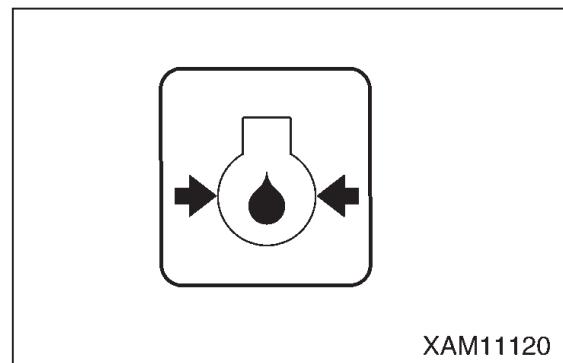
A warning is displayed if an abnormality occurs continuously in the machine.

Check the error code.

**[3] ENGINE OIL PRESSURE MONITOR (3)**

This warning indicates the drop in the engine oil pressure.

If it is displayed when the starter switch is turned to the "ON" position and goes off as the engine rotation increases after the engine is started, the engine oil pressure is normal. If it is displayed during the operation, the engine oil pressure has dropped. Immediately stop the machine and check the clogging of the engine oil filter and engine lubricant level.

**[4] ENGINE WATER TEMPERATURE MONITOR (4)**

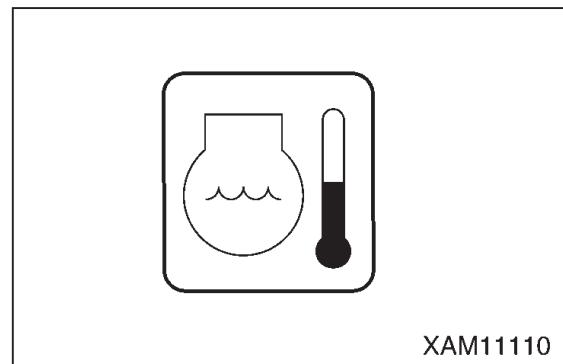
This warning indicates errors with the engine coolant temperature.

The temperature is normal if this monitor is OFF during the operation.

If it is displayed during the operation, it means that the engine coolant temperature exceeded the normal temperature.

Promptly switch the engine rotation to low idling and wait until the monitor goes off (engine coolant temperature goes down).

Then, stop the operation and check the water leakage from the radiator, clogging in the radiator core, and damage and tension of the alternator belt.

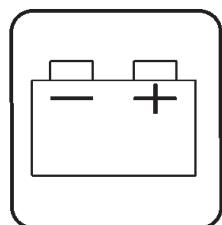


[5] BATTERY CHARGE MONITOR (5)

A warning is displayed if an abnormality occurs in the recharging circuit.

If it lights up during the operation, there is an error in the battery charge system.

Immediately stop the machine and check the tension of the alternator belt.



XAM11130

[6] ERROR CODE DISPLAY (6)

Displays an error code for the current error.



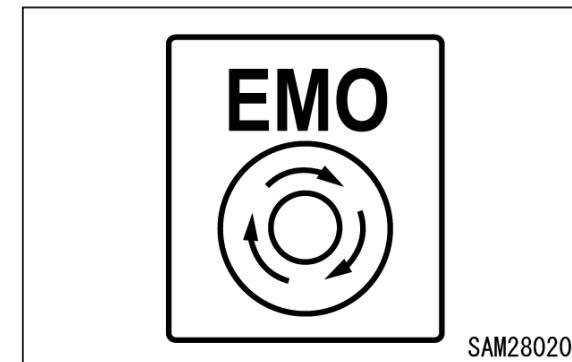
SAM20800

If multiple errors occur simultaneously, check the error history display in user mode.

- ☞ Error codes are also displayed if faults other than consumable related indications are displayed. For more information on error codes, see "6.23 TROUBLESHOOTING FOR REMOTE CONTROL SYSTEM" and take corrective action.

[7] EMERGENCY STOP DISPLAY (7)

Displayed when the emergency stop switch has been pressed. It disappears when the emergency stop is reset.



SAM28020

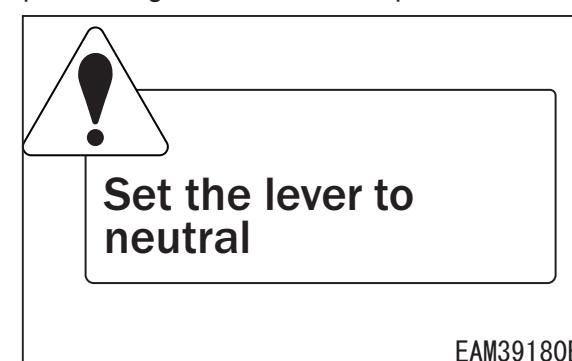
[8] NEUTRAL LEVER POSITION ABNORMALITY DISPLAY (8)

The display will indicate that there was input by either the travelling or crane operation levers when the following conditions were met. At the same time there will be a quick beeping sound.

- Lever input was made when the starter switch was turned to the "ON" position and the monitor startup screen was displayed.
- Lever input was made when the emergency stop was released.
- Lever input was made when an emergency stop was made by radio control and the emergency stop status was released.

When this display appears, the motor will not run.

When the display appears, perform the operation again with no lever input.

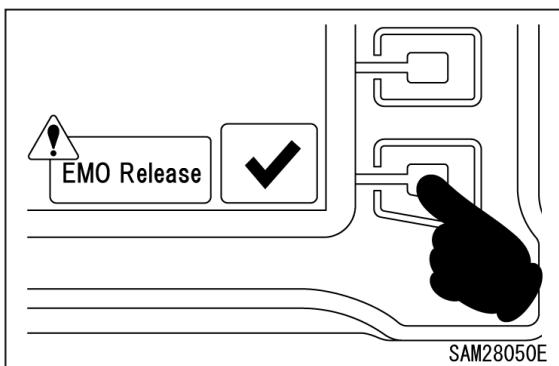


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- ☞ When the boom lift bypass switch is pressed while the boom derricking lever input is made, the warning message "Return the boom raise lever to neutral" is displayed.

[9] EMERGENCY STOP RESET GUIDE
DISPLAY (9)
EMERGENCY STOP RESET SWITCH
(10)

Displayed when the emergency stop switch has been pressed on the radio remote control unit. It disappears once communication is established with the radio remote control unit. To operate the levers on the machine while the guide is displayed, press the emergency stop reset switch at the bottom right of the monitor.

**[Message display]**

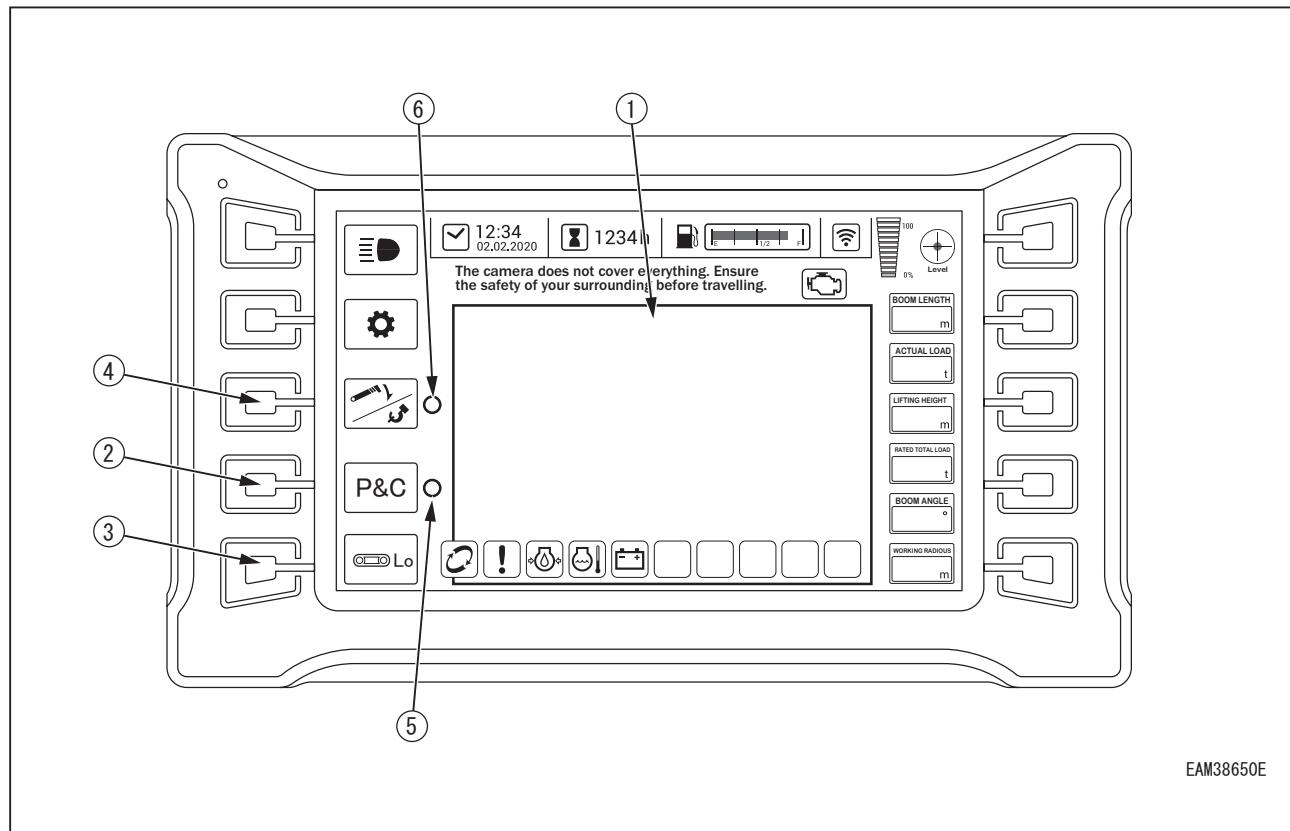
The following messages are displayed on the monitor screen depending on the state of the machine.

- Multiple errors
- Stop idling recommended
- Set time
- Overriding

☞ Depending on the monitor settings, there may be cases when it is not displayed.
For the display / non-display settings, contact us or our sales service agency.

☞ There are messages other than those described above. If a message is displayed on the monitor screen, check the contents well, and proceed according to the message.

4.1.6.5 TRAVEL MODE



(1) Front view camera display	(4) Hook stowage/Boom stowage Switch
(2) Pick & carry switch	(5) Pick & Carry posture lamp
(3) Travelling high-speed switch	(6) Boom stowage position lamp

☞ This section describes only those indications and operations that differ from "4.1.6.2 HOME SCREEN".

[1] FRONT VIEW CAMERA DISPLAY (1)

The image of the front of the machine is displayed.

[2] PICK & CARRY SWITCH (2)**⚠ WARNING**

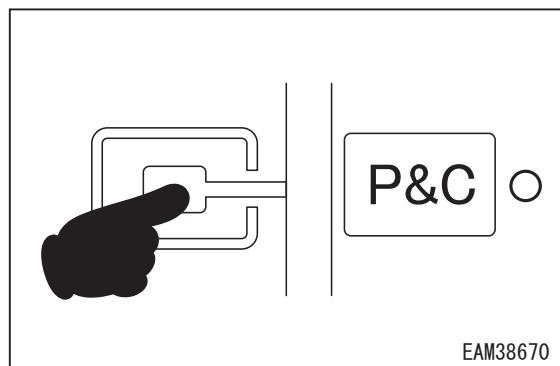
As a rule, Pick & Carry is prohibited since the machine will be very unstable and it accompanies the risk of tip-over.

If you have to perform Pick & Carry by necessity, strictly observe the following cautions.

- Strictly maintain the “Pick & Carry posture” and observe “Rated total load chart for Pick & Carry”.
- Carefully study the situation at the worksite and travel on the flat and solid ground.
- Do not travel on soft ground, irregular ground or ground with many obstacles, in the water, in the snow, and on the frozen surface.
- Switch the engine speed to low during Pick & Carry. Do not make sudden start, sudden stop, and sudden direction change. Keep the hoisted load near ground so that it will not sway.
- The warning alarm buzzer will sound when the machine tilts during crane operation or Pick & Carry. Stop the work immediately when the alarm buzzer sounds, and try to avoid the danger of tip-over.
- Always keep the moment limiter override switch at “OFF” position when performing Pick & Carry.

For more information, see “5.2.26 PICK & CARRY OPERATION.”

Use this switch when performing Pick & Carry.



EAM38670

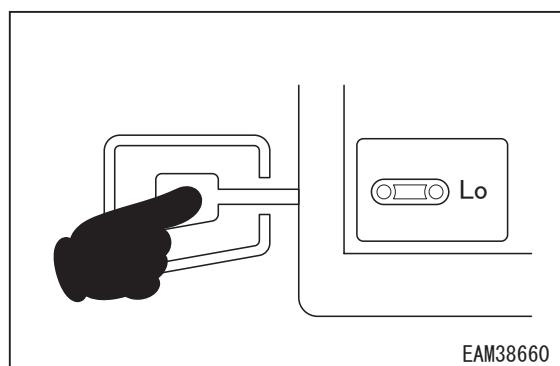
- ON : The letters “P&C” light up in yellow. The machine is now in the Pick & Carry mode.
- OFF : The yellow lit “P&C” letters go off. The Pick & Carry mode is cancelled.

☞ Pressing the Pick & Carry switch will turn the mode off only when in the traveling posture.

If you switch to any mode other than traveling mode while the P&C switch is “ON” and the “Pick & Carry posture lamp (5)” light is off, the message “Cannot switch from Pick & Carry mode. Please switch after changing to travelling or Pick & Carry posture.” will be displayed and a buzzer will sound.

[3] TRAVELLING HIGH-SPEED SWITCH (3)

This is used when changing the travel speed.

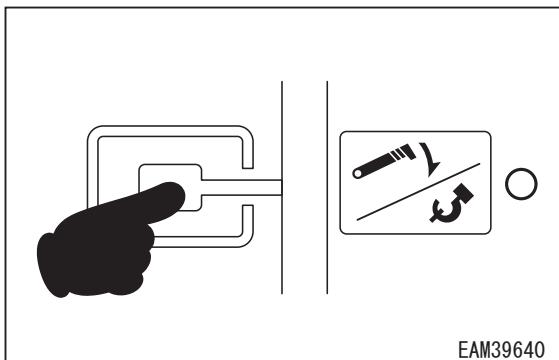


EAM38660

☞ In Pick & Carry mode, travel speed cannot be set to “Hi”.

[4] HOOK STOWAGE/BOOM STOWAGE SWITCH (4)

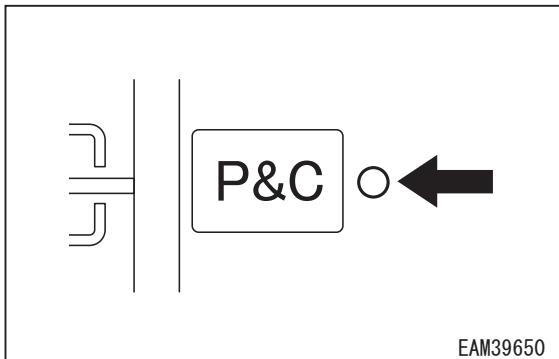
Used when stowing the hook or the boom.
For switch see, "4.1.6.2 HOME SCREEN"
For precautions regarding storage operations, see "5.2.23 CRANE STOWING OPERATION", and for details on the storage procedure, see "5.2.26 PICK & CARRY OPERATION."



[5] PICK & CARRY POSTURE LAMP (5)

Lights up in yellow when the machine is in Pick & Carry posture.

For conditions of Pick & Carry posture, read the section "5.2.26.2 PICK & CARRY POSTURE."

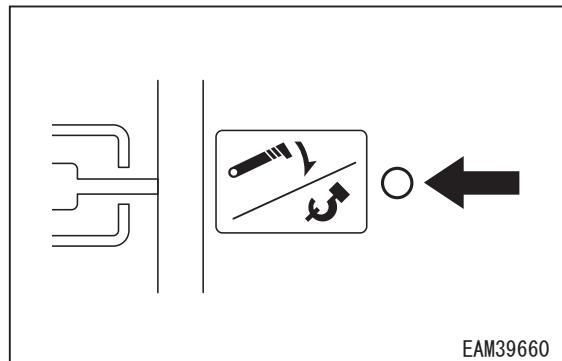


- ☞ This may not light up when lifting a load, even the crane is in Pick & Carry posture. However, this is not a faulty condition.

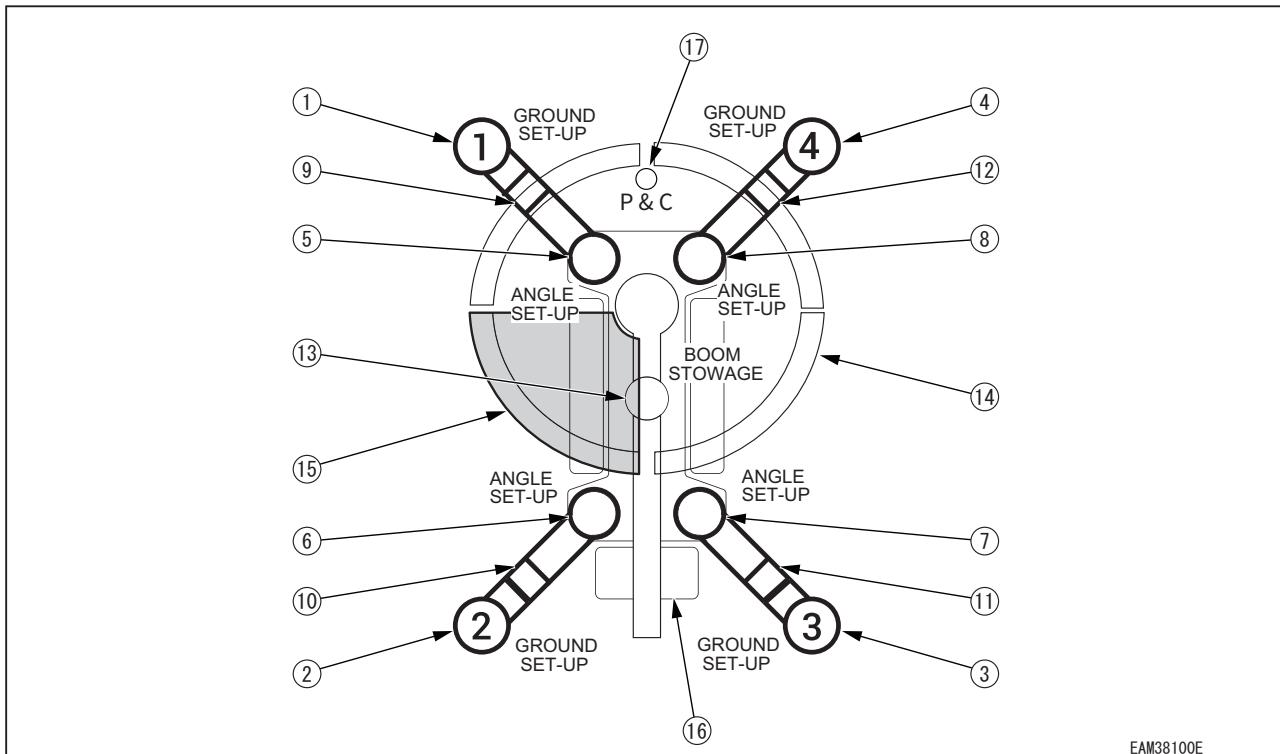
[6] BOOM STOWAGE POSITION LAMP (6)

Lights up in yellow when the boom is in the boom stowed position.

For the conditions of the boom storage position, see "5.2.26 PICK & CARRY OPERATION."



4.1.6.6 OUTRIGGER STATUS DISPLAY SCREEN



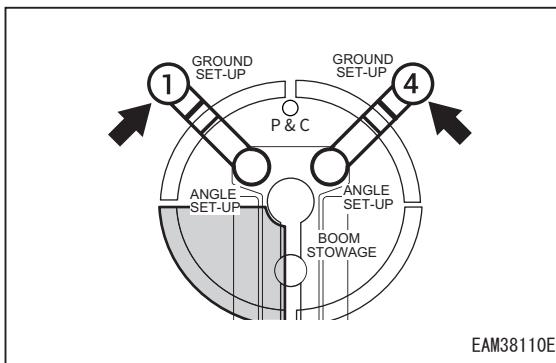
(1) Outrigger ground set-up lamp 1
 (2) Outrigger ground set-up lamp 2
 (3) Outrigger ground set-up lamp 3
 (4) Outrigger ground set-up lamp 4
 (5) Outrigger angle set-up lamp 1
 (6) Outrigger angle set-up lamp 2
 (7) Outrigger angle set-up lamp 3
 (8) Outrigger angle set-up lamp 4
 (9) Outrigger extension lamp 1
 (10) Outrigger extension lamp 2
 (11) Outrigger extension lamp 3
 (12) Outrigger extension lamp 4
 (13) Boom stowage lamp
 (14) Working range status display
 (15) Boom slewing position display
 (16) Operator protection restriction display
 (17) Pick & Carry posture lamp

⚠ WARNING

- Do not remove the detectors or disassemble them for repair. In addition, do not move the detection switches.
- If a collision with an object noticeably damages the detectors, be sure to confirm that the lamps in the outrigger display area still turn on and off and confirm the operation status for the crane interlock and outrigger interlock functions. If an anomaly has occurred, contact us or our sales service agency.
- When setting the outriggers, check that the position pins are securely inserted. The display of each lamp may be affected.

[1] OUTRIGGER GROUND SET-UP LAMP (1)~(4)

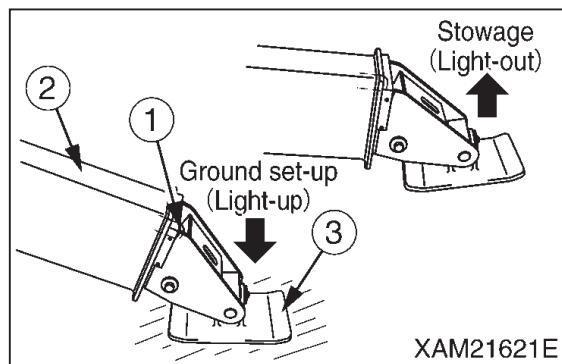
The lamp lights up to notify that the outrigger is grounded.



- Green light:
When the outrigger foot is in contact with the ground

- Red light:

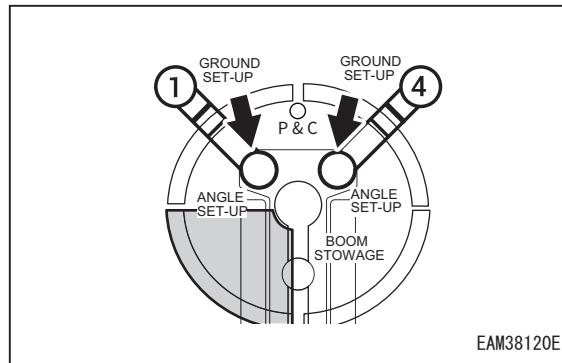
When the outrigger foot has risen (excluding when stowed)



☞ The conditions of the outrigger foot are detected by the detection switch at the bottom of the outrigger cylinder. There is a detection switch at the bottom of all four outrigger cylinders.

[2] OUTRIGGER ANGLE SET-UP LAMP (5)~(8)

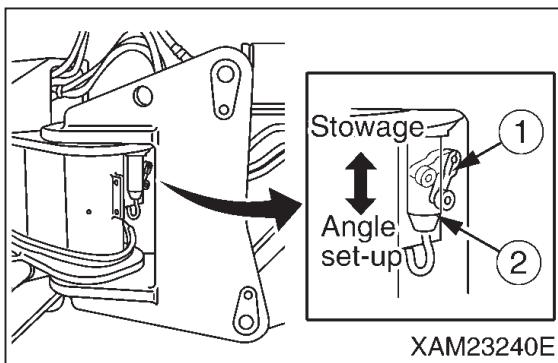
The lamp lights up to notify the operator of the status of the outrigger rotation angle.



- Green light:
When the position pin is inserted.

- Red light:

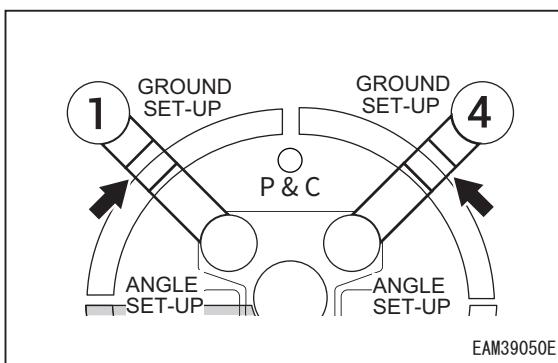
When the position pin is removed.



- ☞ The extraction/insertion of the position pin (2) is detected by the detection switch (1) of the outrigger rotary.

[3] OUTRIGGER EXTENSIN LAMP (9)~(12)

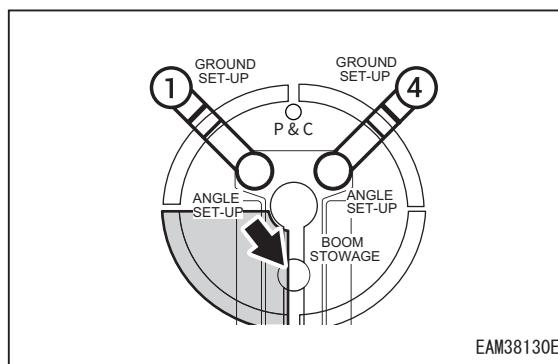
The lamps turn on and off in 3 stages to notify the operator of the state corresponding to the outrigger length.



- MAX Extension light:
When the outrigger length is at its maximum.
- MID Extension light:
When the outrigger length has deviated even slightly from its maximum and until the second stage lamp turns off.
- MIN Extension light:
When the outrigger length has deviated even slightly from the second stage and until it is at its minimum.

[4] BOOM STOWAGE LAMP (13)

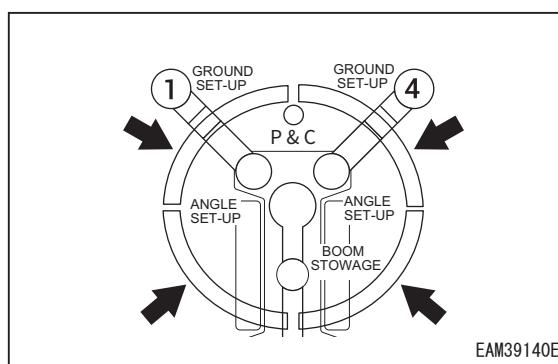
This lamp turns on to notify the operator that the boom is stowed.



- Green light:
Boom stowed.
- Yellow light:
Only stowed at slewing stowage position.
- Red light:
Not yet stowed in slewing stowage position or boom fully lowered position.

[5] WORKING RANGE STATUS DISPLAY (14)

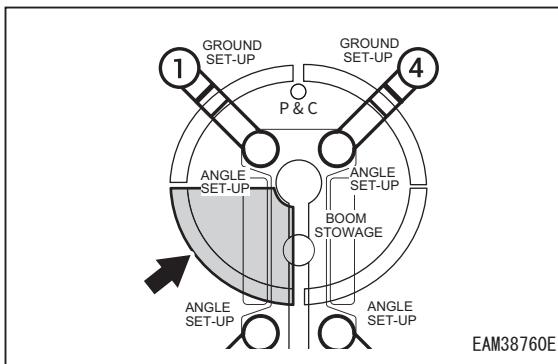
This displays the job range of the crane when in the outrigger set up status. The lifting performance in the range of each job is displayed with a blue light, yellow light, orange light, and red light.



- Blue light : Maximum rated total load
- Yellow light : Medium rated total load
- Orange light : Minimum rated total load
- Red light : Crane working prohibited

[6] BOOM SLEWING POSITION DISPLAY (15)

The boom slewing position corresponding to the working range status display is displayed with the same colour coding as the working range status display in a fan shape. The light is always off on the outrigger in operation screen.

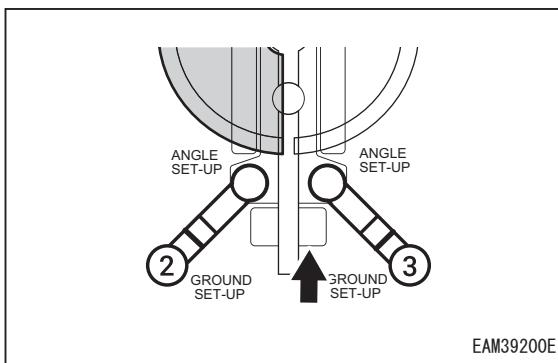


[7] OPERATOR PROTECTION RESTRICTION DISPLAY (16)

The lamp lights up to notify that the boom derrick angle and boom slewing angle are within the range that limits the boom slewing operation.

For more information on the limit range, see "5.2.21 SLEWING OPERATION."

- Green light:
The boom derrick angle and boom slewing angle are out of the limit range.
- Red flash:
The boom derrick angle and boom slewing angle are within the limit range.

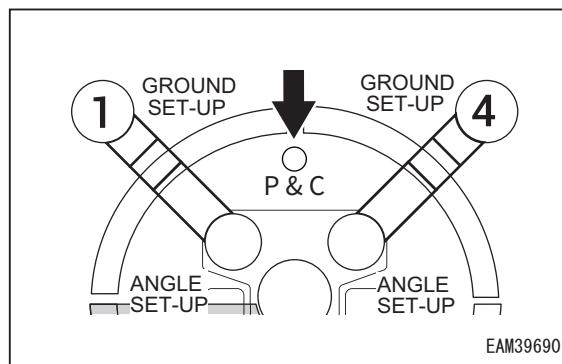


☞ Within the range that the boom slewing operation is limited, boom lowering operation is unable.

[8] PICK & CARRY POSTURE LAMP (17)

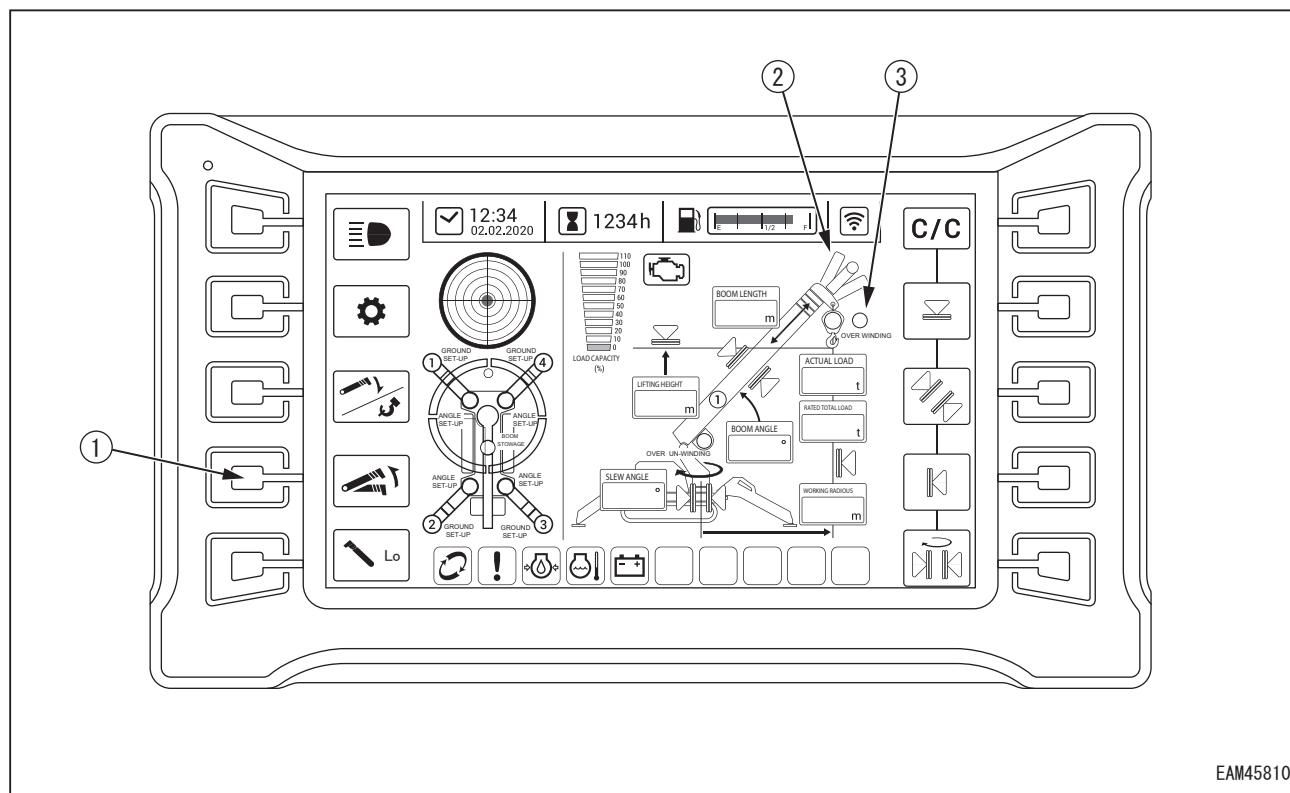
Lights up in yellow when the machine is in Pick & Carry posture.

For conditions of Pick & Carry posture, read the section "5.2.26 PICK & CARRY OPERATION."



4.1.7 MONITOR(SEARCHE HOOK)

4.1.7.1 HOME SCREEN



(1) Boom Lift Bypass Switch

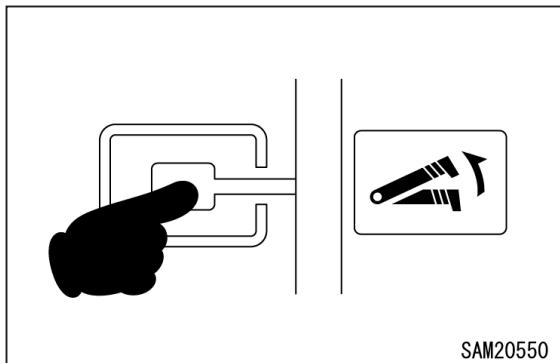
(3) Overwinding Display

(2) Searcher Hook Position Display

☞ This section describes only those indications and operations that differ from normal use when using a searcher hook. For more information on indications and switch operations not described in this section, see "4.1.6.2 HOME SCREEN."

[1] BOOM LIFT BYPASS SWITCH(1)

If it becomes necessary to raise the boom while automatically stopped, the boom can be raised only while the Boom Lift Bypass Switch is depressed.

**[2] SEARCHER HOOK POSITION DISPLAY(2)**

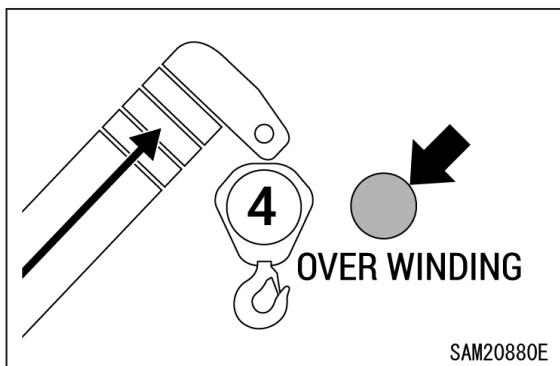
The display will change depending on the searcher hook position setting.

For more information on the position and display details, see “4.1.7.3 850kg SEARCHER HOOK POSITION SETTINGS.”

[3] OVERWINDING DISPLAY(3)

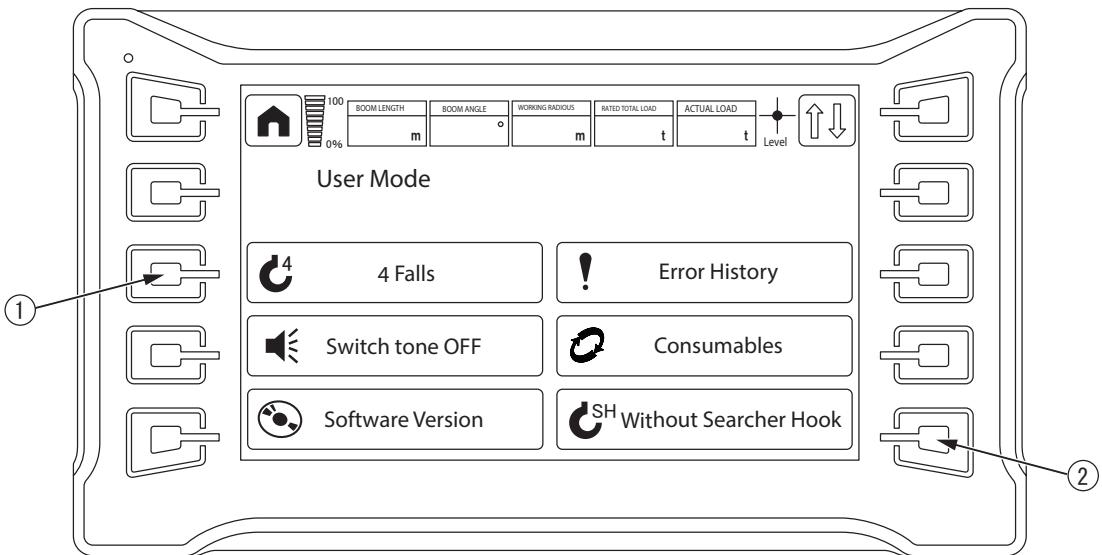
The red light illuminates if the hook is overwound during operation.

The green light illuminates only if the overwinding detector is disabled while using the searcher hook.

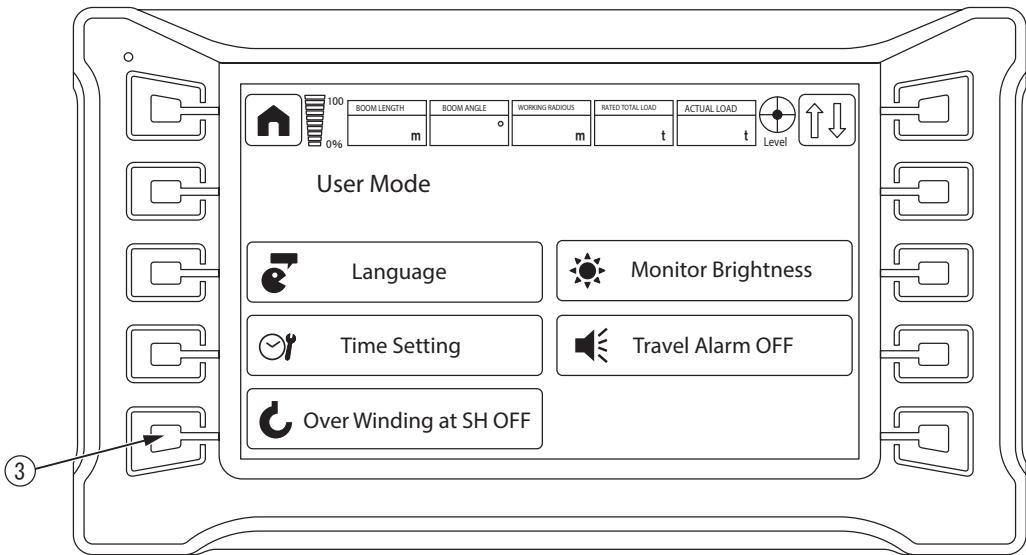


4.1.7.2 USER MODE

1/2 page



2/2 page



EAM45860

(1) Hook Hanging Number Setting/Searcher Hook Position Setting
 (2) Searcher Hook Setting

☞ This section describes only those indications and operations that differ from normal use when using a searcher hook. For more information on indications and switch operations not described in this section, see "4.1.6.3 USER MODE."

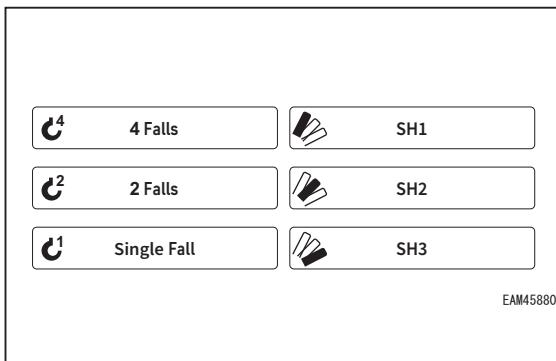
(3) Overwinding SH ON/OFF Setting

☞ The searcher hook is abbreviated in some places as 'SH'.

[1] HOOK HANGING NUMBER SETTING/ SEARCHER HOOK POSITION SELECTION

Used when switching the searcher hook position setting. For more information on the actual position and position switching, see “4.1.7.3 850kg SEARCHER HOOK POSITION SETTINGS” or “4.1.7.4 1.5t SEARCHER HOOK POSITION SETTINGS.”

- ☞ The searcher hook position (SH1/SH2/SH3) will be displayed only when “With Searcher Hook 850kg” or “With Searcher Hook 1.5t” is selected at searcher hook setting. For more information on how to change the searcher hook setting, see “4.1.7.2 [2] SEARCHER HOOK SETTING”.



[2] SEARCHER HOOK SETTING

⚠ WARNING

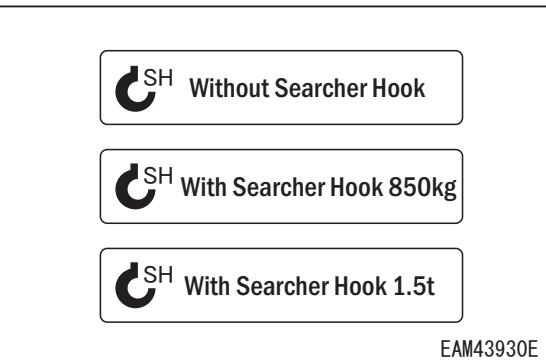
Make sure that the searcher hook setting matches the actual conditions. If set incorrectly, a serious accident could occur.

Use this switch to switch the searcher hook setting.

- Without Searcher Hook:
Select when searcher hook is not attached.
- With Searcher Hook 850kg:
Select when 850kg searcher hook is attached.
- With Searcher Hook 850kg:
Select when 850kg searcher hook is attached.

- With Searcher Hook 1.5t:

Select when 1.5t searcher hook is attached.



[3] OVERWINDING SH ON/OFF SETTING

⚠ WARNING

Overwinding “OFF” should only be selected when the hook block is removed and the searcher hook is being used. If “OFF” is selected when the searcher hook is used, and the hook block is installed, the overwinding prevention device will not operate, and there is a danger that the hook block will fall.

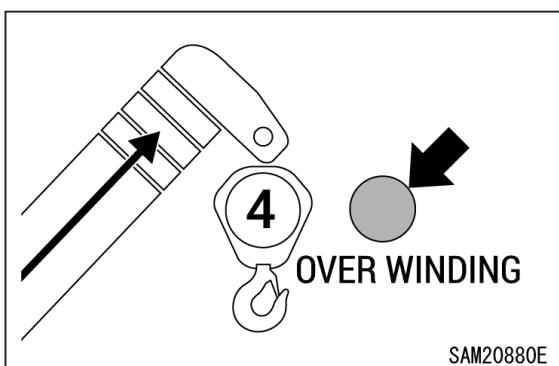
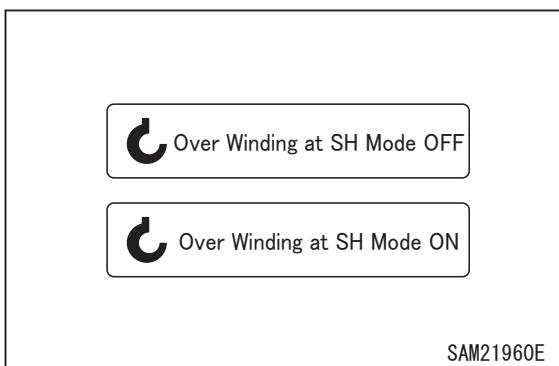
The overwinding prevention device function ON/OFF when using searcher hook.

- OFF:

The overwinding prevention device function is cancelled. Monitor overwinding icon is continuously lit up green.

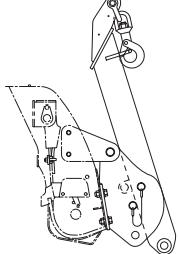
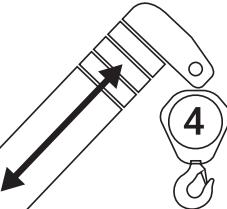
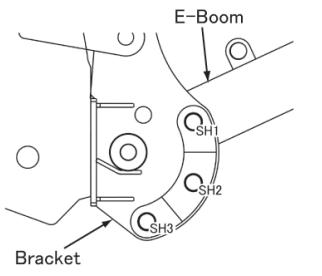
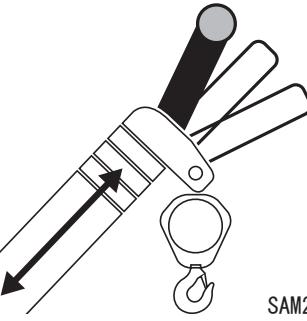
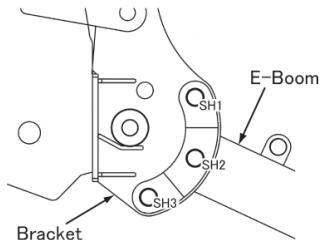
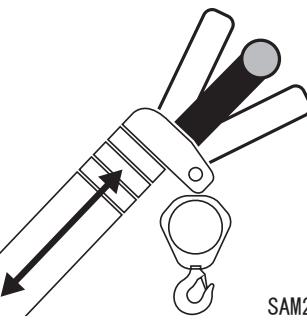
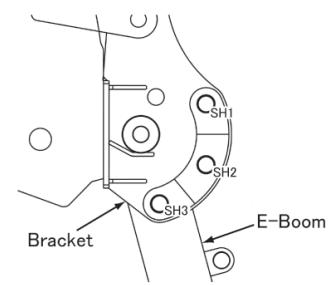
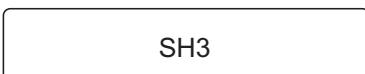
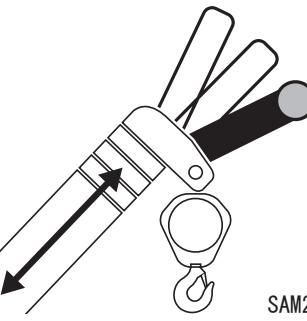
- ON:

The overwinding prevention device function is operating normally.

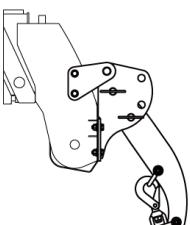
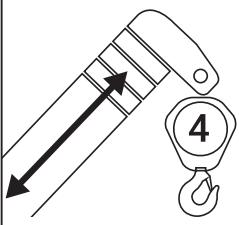
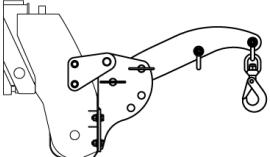
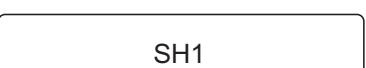
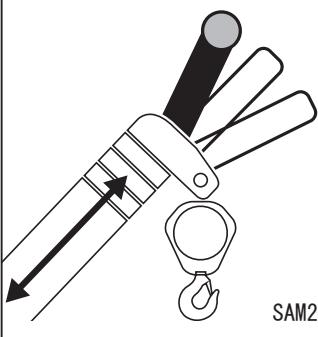
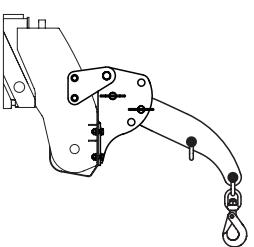
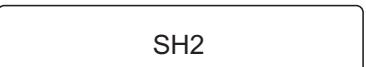
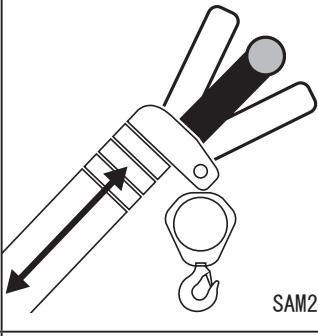
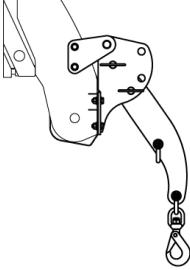
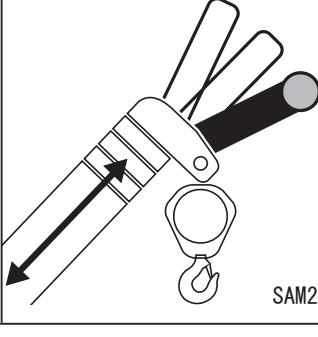


- ☞ The overwinding SH ON/OFF setting switch is displayed in User Mode only when searcher hook positions "SH1 / SH2 / SH3" are selected.

4.1.7.3 850kg SEARCHER HOOK POSITION SETTINGS

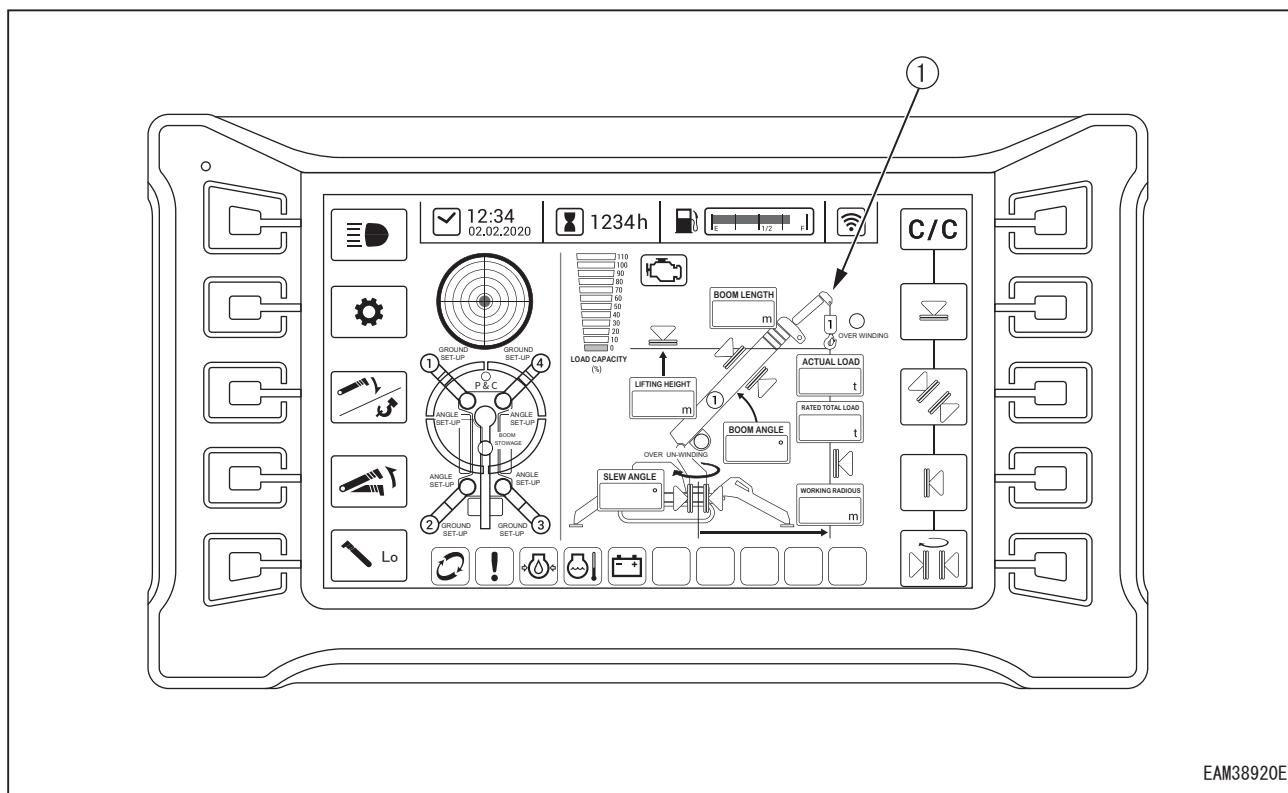
	Actual machine position	Selector switch	Position display
Stowing	 EAM6590		 SAM21590
SH1	 When a E-Boom is set SH1		 SAM21600
SH2	 When a E-Boom is set SH2		 SAM21610
SH3	 When a E-Boom is set SH3		 SAM21620

4.1.7.4 1.5t SEARCHER HOOK POSITION SETTINGS

	Actual machine position	Selector switch	Position display
Stowing	 SAM24340	 SAM21550E	 SAM21590
SH1	 SAM24350	 SAM21560	 SAM21600
SH2	 SAM24361	 SAM21570	 SAM21610
SH3	 SAM24370	 SAM21580	 SAM21620

4.1.8 MONITOR(FLY-JIB)

4.1.8.1 HOME SCREEN



(1) Fly-jib display

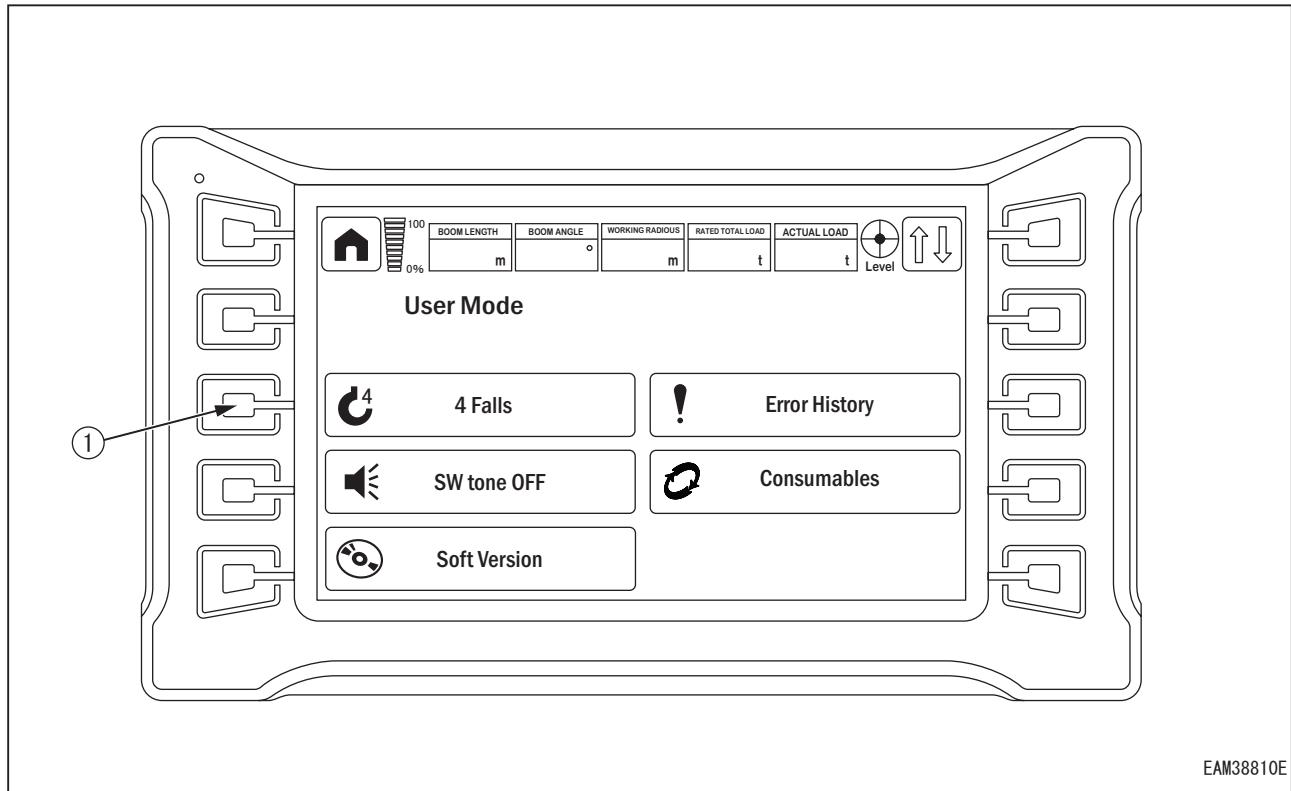
☞ This section describes only those parts of the display and operation that differ from normal use when the fly-jib is in use.

For displays and switch operations not described in this section, see "4.1.6.2 HOME SCREEN."

[1] FLY-JIB DISPLAY(1)

This is displayed when the fly-jib mode is switched to fly-jib mode.

4.1.8.2 USER MODE



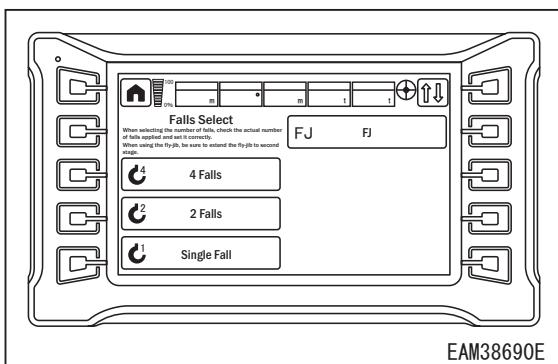
(1) Number of falls change

☞ This section describes only those parts of the display and operation that differ from normal use when the fly-jib is in use.

For displays and switch operations not described in this section, see "4.1.6.3 USER MODE."

[1] NUMBER OF FALLS CHANGE(1)

Use this to switch to Fly-Jib mode.



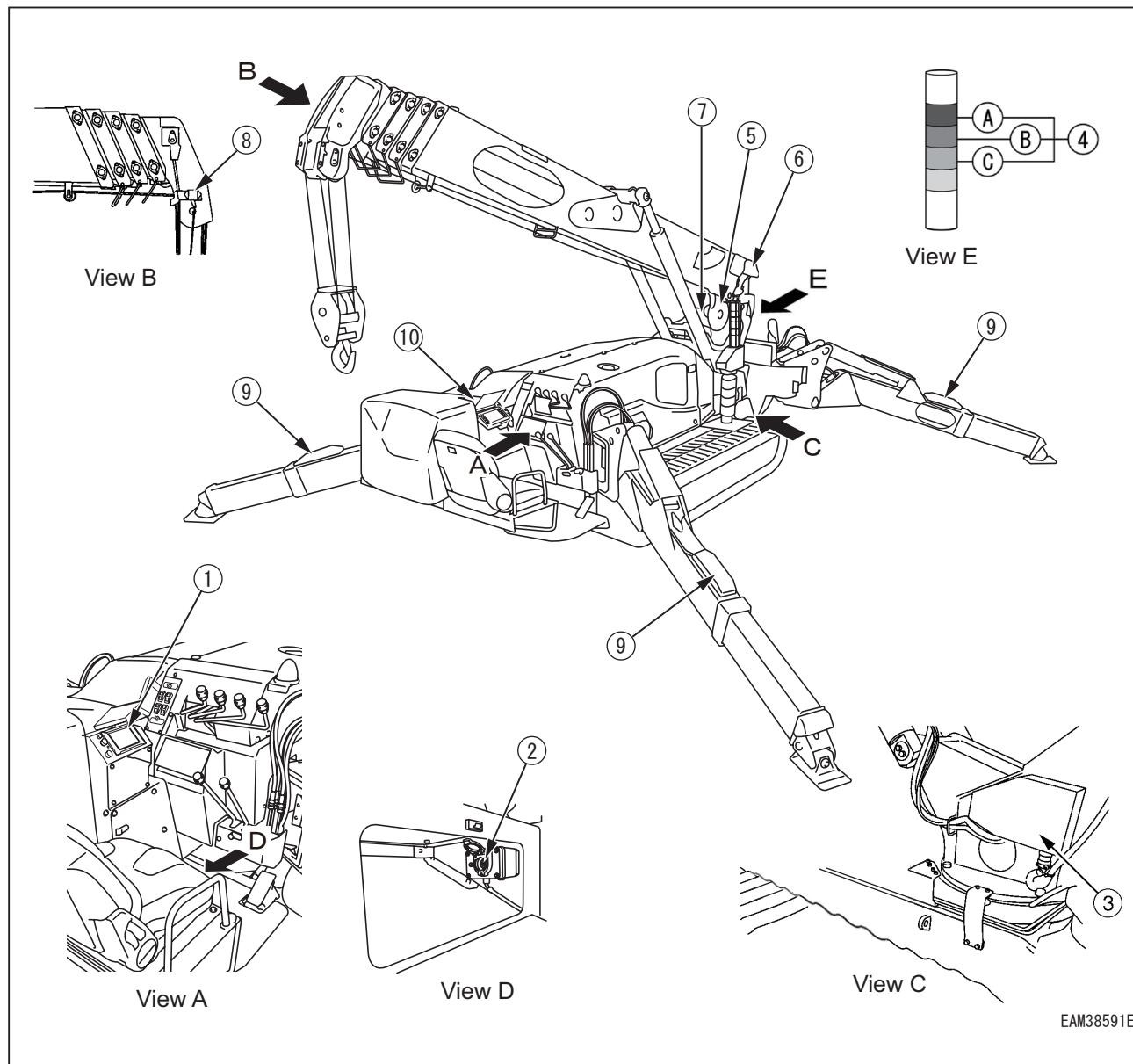
☞ The Fly-Jib is abbreviated in some places as 'FJ'.

⚠ WARNING

Whenever Fly-jib is installed, always extend the jib to second stage. The working radius and lifting height indication of fly-jib mode moment limiter is calculated based on the length of second stage Fly-jib.

4.1.9 MOMENT LIMITER (OVERLOAD PREVENTION DEVICE)

4.1.9.1 MOMENT LIMITER COMPONENTS



- (1) Monitor
- (2) Moment limiter override switch
- (3) Sub controller (TTC30X) (Inside the cover on the post)
- (4) Working status lamp
 - (A) Red working status lamp (Warning lamp for load factor of 100% or more)
 - (B) Yellow working status lamp (Prediction Alarm lamp for load factor of 90 to 100%)
 - (C) Green working status lamp (Working lamp for load factor of less than 90%)

- (5) Boom length sensor (inside boom)
- (6) Boom angle sensor (side of boom rear edge)
- (7) Pressure sensor (derrick cylinder) (two parts)
- (8) Overwinding detector (side of boom tip)
- (9) Outrigger position detection switch
- (10) Main controller (TTC540) (Inside rear cover)

4.1.9.2 FUNCTION OF MOMENT LIMITER

DANGER

- Do not remove, disassemble, or repair detectors. Do not move the detectors to another location from original position.
- Should an object hit a detector or you find any damage on a detector, be sure to verify the operation status of the auto stop.

If you find any abnormality with the operation of the auto stop, do not fail to fix it.

- Do not turn ON the moment limiter override switch unless you find an error or check/perform maintenance on detectors.

Setting the moment limiter override switch to the “ON” position disables the moment limiter function for three minutes.

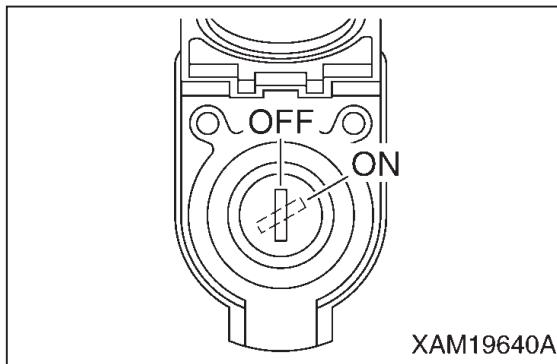
Overloading can cause the hoisted load to fall, boom breakage, or tip-over of this machine that can lead to serious accidents resulting in death or serious injury.

Note that if the moment limiter override switch is set to the “ON” position and the moment limiter function is disabled, the working status lamp will light up in red and the warning alarm buzzer will sound.

- **The machine will not stop automatically even if the crane is overloaded during the boom slewing operation. Do not slew the crane when being overloaded.**

- When the boom approaches the stop position during the operation, be sure to change the operation speed of the boom to low speed.

With high-speed boom operation, the boom may overshoot the specified stop position, causing serious accidents such as tip-over of the machine resulting in death or serious injury.



The moment limiter is a device installed to prevent the hoisted load from falling, the boom from breaking, or the machine from tip-over due to overloading.

Always check the operation of the moment limiter before crane operation to verify no abnormality.

[1] MECHANISM OF MOMENT LIMITER

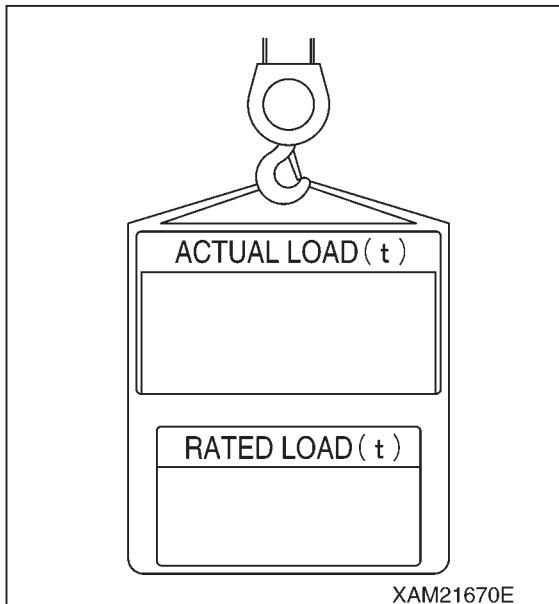
The moment limiter calculates the current rated total load by determining the following:

- The current boom posture using the boom angle sensor and boom length sensor
- The current outrigger setting status using the limit switches
- The number of falls, as entered by the operator

Then by actually hoisting a load, the “Actual load” (hoisted load) is sent from the pressure sensor of the derrick cylinder to the moment limiter.

The moment limiter comparatively calculates between the “rated total load” computed out of the current posture and the “actual load” (hoisted load), and issues an alarm if the result indicates the actual load/rated total load=90 to 100%.

If the calculation result indicates the actual load/rated total load=above 100%, then as well as the alarm being issued, the boom's dangerous operation is automatically stopped.



[2] DISPLAY OF MOMENT LIMITER ERROR MESSAGES

The moment limiter performs self-diagnosis on the moment limiter display unit when an error is issued by the boom angle sensor, boom length sensor, pressure sensor, or when a circuit is opened or a connector is disconnected.

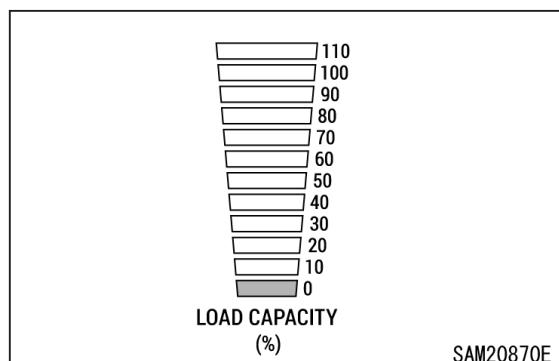
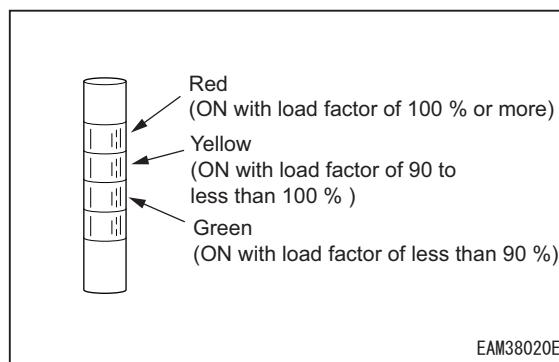
The result is displayed on the "Rated total load Display" of the moment limiter display unit by an error code to notify the operator of the error. Immediately stop the use of the crane when an error code is displayed.

See "6.23 TROUBLESHOOTING FOR REMOTE CONTROL SYSTEM."

[3] OVERLOAD ALARM

1. Safety Area ("Actual load" is less than 90% of the "Rated Total Load")
 - The green colour of the Working Status Lamp flashes.
 - The load factor indicator (green) turns on.

2. Prediction Alarm ("Actual load" is 90 - less than 100% of the "Rated Total Load")
 - The yellow colour of the Working Status Lamp flashes.
 - The load factor indicator (yellow) turns on.
 - The alarm generates intermittent sound "peep".
3. Limit Alarm ("Actual load" is greater than or 100% of "Rated Total Load")
 - The red colour of the Working Status Lamp flashes.
 - The load factor indicator (red) turns on.
 - The alarm generates continuous sound "peep".
 - Operation of the crane's danger side stops automatically.



4. Clearing of limit alarm automatic stop

When an automatic stop occurs, immediately perform recovery operation.

For more information, see "4.1.9.3 [2] RECOVERY OPERATION AFTER AUTO STOP."

[4] WORKING RANGE LIMITS DEVICE

When the working range gets close to the set restriction value, a warning is issued to notify the operator and people around of the situation. The last status of the set value for the working range restriction is memorised even if the starter switch is turned to the OFF position.

- ☞ For more information on setting working range limits, see “4.1.9.5 MOMENT LIMITER WORKING RANGE SETTING.”
- ☞ The alarm buzzer and working status lamp indications may differ depending on the usage conditions.

When the working range is set:

1. Safety Area

- The applicable working range limits display lights up in orange.

2. Prediction Alarm

The following occurs when the control levers are moved toward their limits:

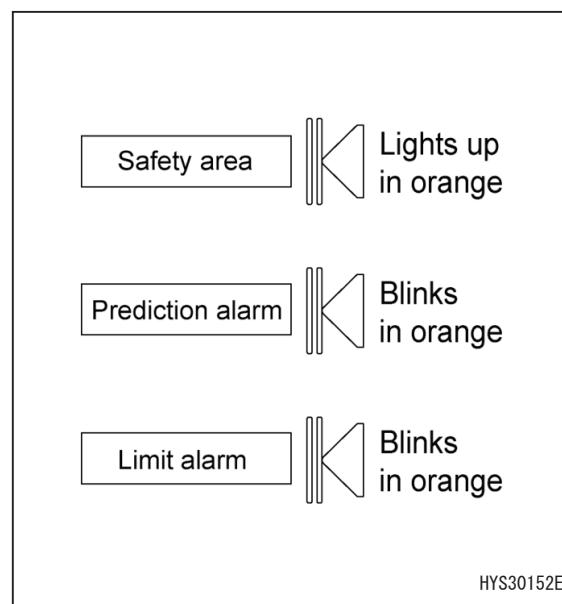
- The applicable working range limits display flashes in orange.
- The alarm buzzer generates intermittent sound “peep”.

3. Limit Alarm

The following occurs when the control levers are moved toward their limits:

- The applicable working range limits display flashes in orange.
- The alarm generates continuous sound “peep”.
- The yellow colour of the Working Status Lamp flashes.

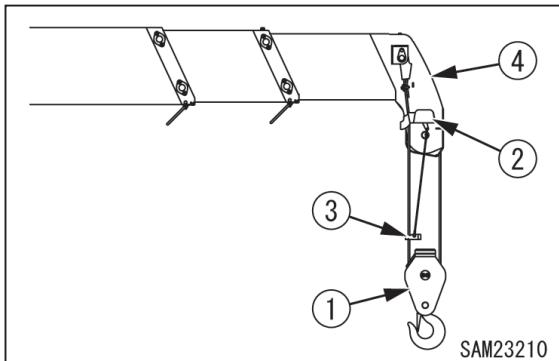
- Operation of the applicable crane motion stops automatically.



HYS30152E

[5] OVERWINDING DETECTOR**IMPORTANT**

When hoisting the hook, be careful of clearance between the hook and boom. When the boom is extended, the hook is also hoisted. Perform boom extension operation while always checking the hook height.



(1) Hook block

(2) Overwinding detector

(3) Weight

(4) Boom

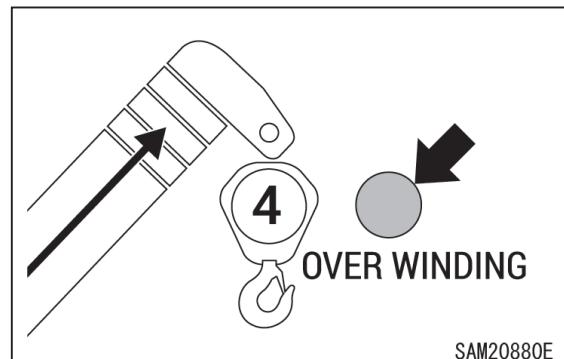
- When the hook block (1) was hoisted up or the boom (4) was extended, the overwinding detector activates the buzzer to warn the operator of overwinding if the hook block (1) approached the end of the boom (4) and pushed up the weight (3).
- At the same time, the hoisting up of the hook block (1) and the extension of the boom (4) stop automatically.

If the hook is over wound when the hook is hoisted or the boom is extended:

- The overwinding indication on the monitor turns on (red).
- The alarm issues intermittent sounds.
- Hook hoisting up and boom extension actions

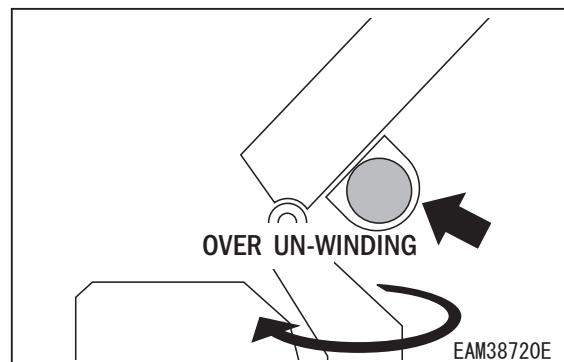
stop automatically.

When an automatic stop occurs, immediately recover from the stop. For recovery operation, perform hook hoisting down operation and boom retraction operation.

**[6] OVER UN-WINDING PREVENTION DEVICE**

If the hook block is hoisted down and there is less wire rope inside the winch drum, the device is in the following state:

- The monitor's over un-winding display is lit red.
- If the hook block hoisting down operation is performed, the alert buzzer will sound intermittently.
- The hook block hoisting down operation is automatically stopped.

**[7] NUMBER OF FALLS DISPLAY****⚠ CAUTION**

- Stop the crane operation when changing the number of falls hooked using the number of falls selector switch. Changing the number of falls during the crane operation can cause unexpected accidents.

- Perform the crane operation always after matching the number of falls display on the moment limiter and the actual number of falls. Mistaking the number of falls cause serious accidents.

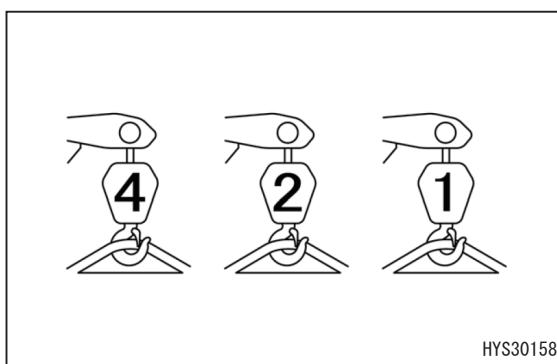
The wire rope has the safe load per wire rope determined.

Determine the number of falls according to the maximum load to be hoisted.

The actual number of falls hooked and the number of falls display on the moment limiter must match.

With this machine, the hook for four/two falls is referred to as the standard specifications.

The last status of the set number of falls is memorised even if the starter switch is turned to the OFF position.



- ☞ If the actual load is 0.3t or more, the number of falls cannot be changed. If the number of falls cannot be changed, the actual load display will flash to notify you.

[8] OUTRIGGER EXTENSION DETECTION

The outrigger set up status is detected with the limit switch mounted to each of four outriggers, lighting the appropriate LED (blue) of the "MIN", "MID", or "MAX" and changing the rated total load.

[Working status lamp states]

Colour	Lighting status	Lighting condition
All	Flashing	<ul style="list-style-type: none"> • 3 seconds after start-up
Red	Flashing	<ul style="list-style-type: none"> • With load factor of “100% or higher” • Boom is within the slewing prohibited range. • The hook is being stowed. • The boom is being stowed. • The override switch is in the “ON” position • Outrigger un-set warning
Yellow	Flashing	<ul style="list-style-type: none"> • With load factor of “90 to less than 100%” • (Note that if the load factor exceeds 100%, the lamp will continue to flash in red even when it drops below 100%, unless the load factor is first reduced to below 90%.) • The crane is stopped due to operating range restrictions.
Green	Flashing	<ul style="list-style-type: none"> • With load factor of “less than 90%” • When the work selector switch (travel/outrigger/crane) is in travel position.
Blue	Light up	<ul style="list-style-type: none"> • Communication with the transmitter is established.
-	Off	<ul style="list-style-type: none"> • Starter switch is in the OFF position

If the working status lamp is subject to multiple states, light up takes priority, as follows:

Flashing red > Flashing yellow > Flashing green

4.1.9.3 MOMENT LIMITER OPERATIONS

The moment limiter is a device for unexpected events. Operations relying on the device will rather incur danger.

Pay sufficient attention during the operation not to cause auto-stop of the crane.

[1] PROHIBITED ACTIONS AFTER AUTO STOP

⚠ DANGER

The following crane operations are prohibited after the crane has stopped automatically due to overloading. These operations may cause tip-over of the machine or breakage of the boom and are very dangerous.

- Boom lowering operation
- Boom extending operation
- Hook hoisting up operation
- Boom slewing operation (depending on operating conditions)
- Boom raising operation

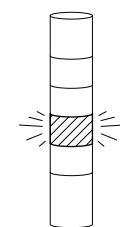
[2] RECOVERY OPERATION AFTER AUTO STOP

⚠ DANGER

- Be sure to switch the engine speed to low speed and perform crane operation carefully if the moment limiter load factor is 90% or higher.
- Performing crane operation at high engine speed will sway the hoisted load and is very dangerous, causing overloading and it may break the boom

1. With load factor of "less than 90%"

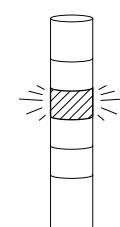
When the hoisting load is less than 90% of the rated total load, the working status lamp lights in green, indicating normal operation status.



EAM38030

2. With load factor of "90 to less than 100%"

When the hoisting load reaches 90% of the rated total load (prediction alarm), the working status lamp changes from green to yellow and the alarm sounds, notifying the operator and those around that the hoisting load is close to the rated total load.

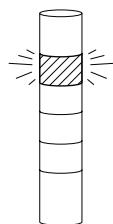


EAM38040

3. With load factor of “100% or higher”

When the hoisting load reaches 100% of the rated total load by continuing the crane operation after exceeding 90% of the rated total load (prediction alarm), the working status lamp changes from yellow to red and the alarm now sounds continuously. The following crane operations will stop automatically.

- Hook hoisting up operation
- Boom extending operation
- Boom lowering operation
- Boom slewing operation (depending on operating conditions)
- Boom raising operation

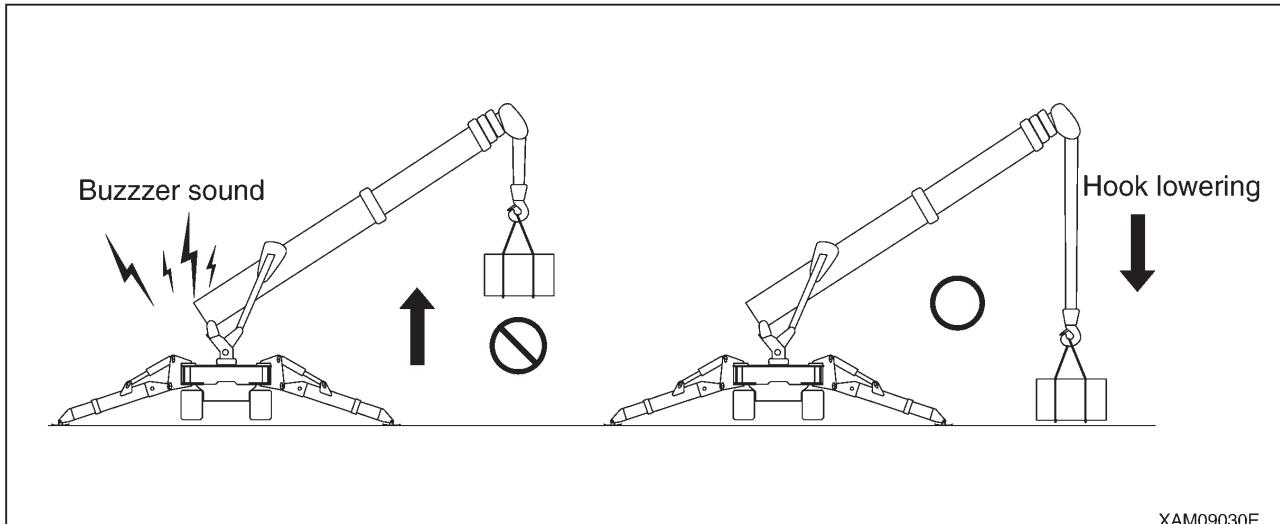


EAM38050

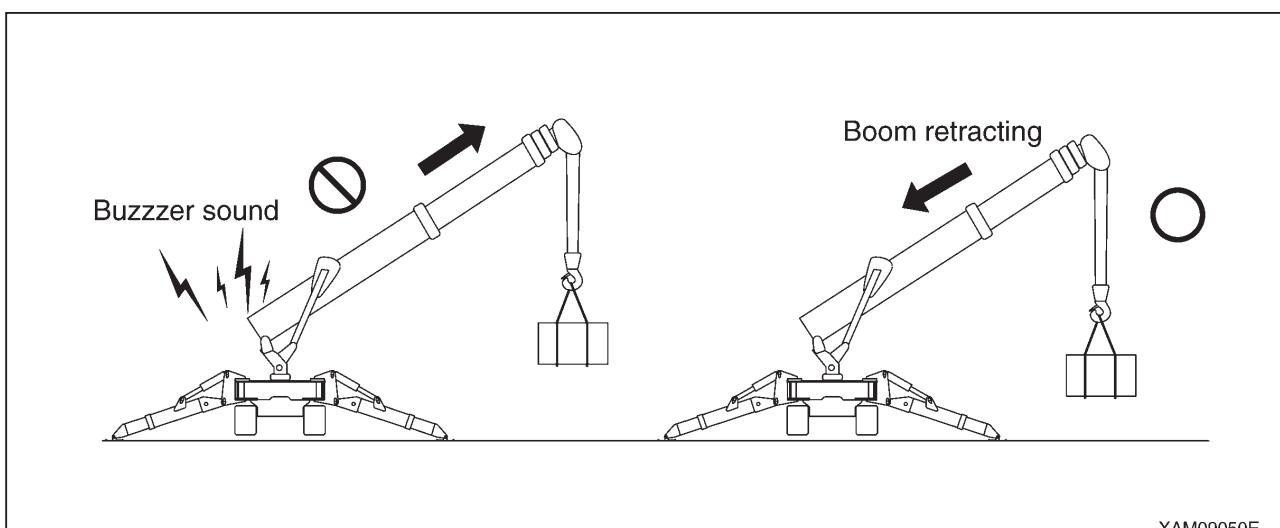
4. Recovery Operation from Auto Stop

The recovery operation from overloading should be the reverse operation of the crane operation that caused the auto stop. Perform one of the followings.

- (1) Hoist down the hook and put down the hoisted load on the ground.

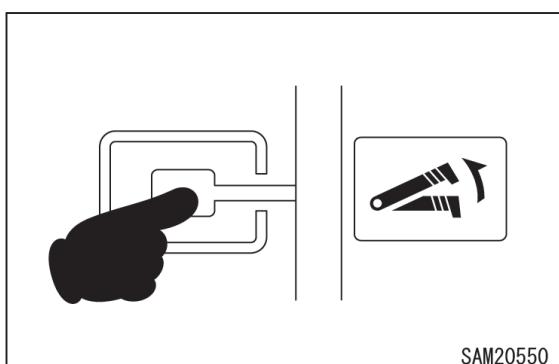


- (2) Retract the boom.



5. Recovery operation using boom raising:

If the boom was stopped automatically, note that you can raise it only while depressing the Boom Lift Bypass Switch.

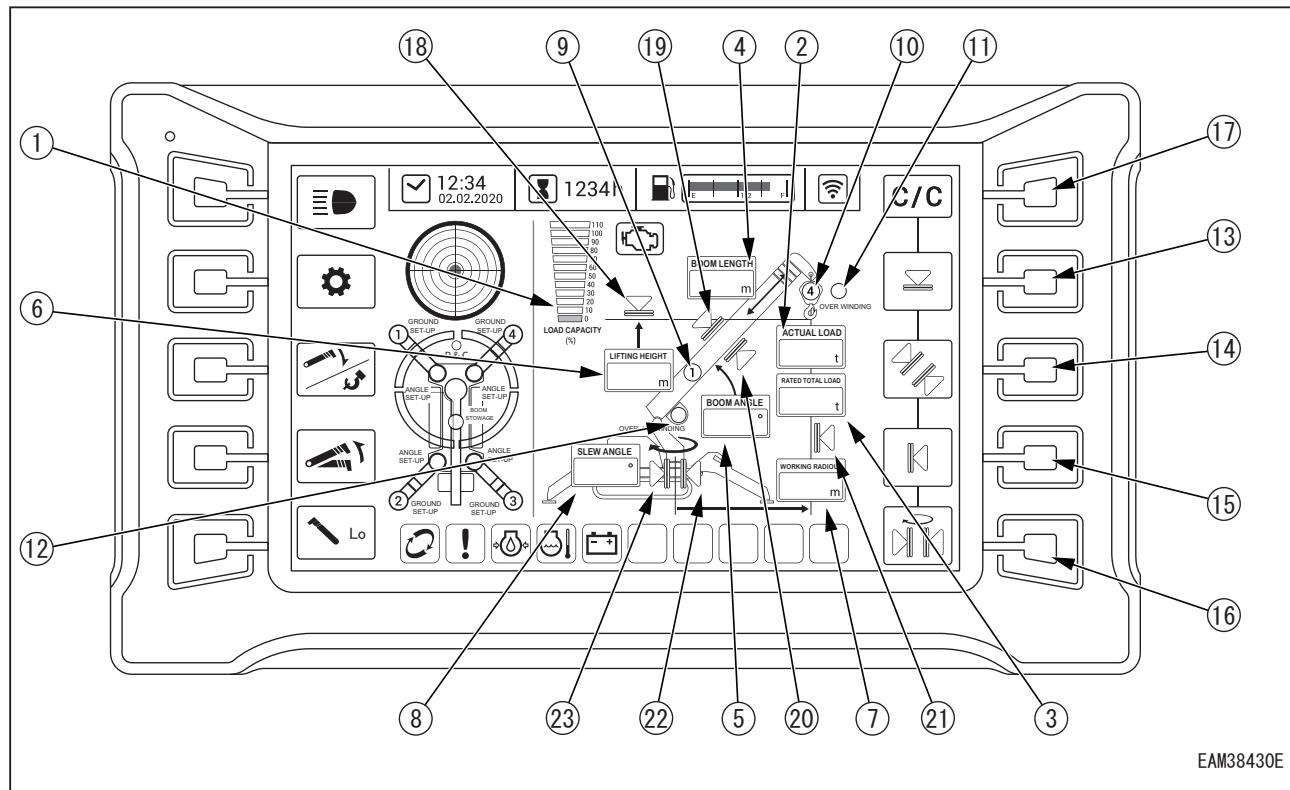


DANGER

Use this switch only when the boom has stopped automatically after entering the overload area during boom lowering or telescoping.

Do not use this switch to lift loads off the ground under normal conditions. Using this switch to lift loads off the ground may damage the machine or cause toppling or other serious accidents.

4.1.9.4 MOMENT LIMITER DISPLAY



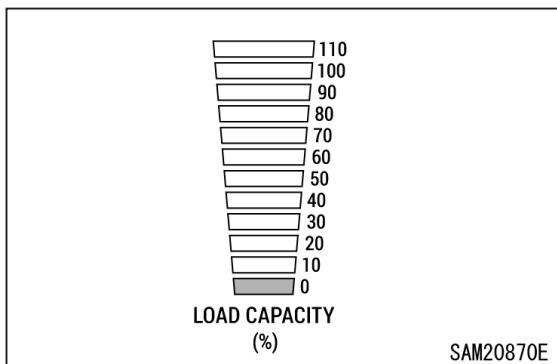
- (1) Load Factor display
- (2) Actual load display
- (3) Rated total load display
- (4) Boom length display
- (5) Boom angle display
- (6) Maximum lifting height above ground display
- (7) Working radius display
- (8) Slewing angle display
- (9) Display of the number of boom sections
- (10) Number of falls display
- (11) Overwinding display
- (12) Over un-winding stop display

- (13) Lifting height upper limit switch
- (14) Boom angle upper limit/lower limit switch
- (15) Working radius upper limit switch
- (16) Slewing angle limit switch
- (17) Setting check/cancelling switch
- (18) Lifting height upper limit display
- (19) Boom angle upper limit display
- (20) Boom angle lower limit display
- (21) Working radius upper limit display
- (22) Clockwise (right) slewing angle limit switch
- (23) Counterclockwise (left) slewing angle limit switch

[1] LOAD FACTOR DISPLAY (1)

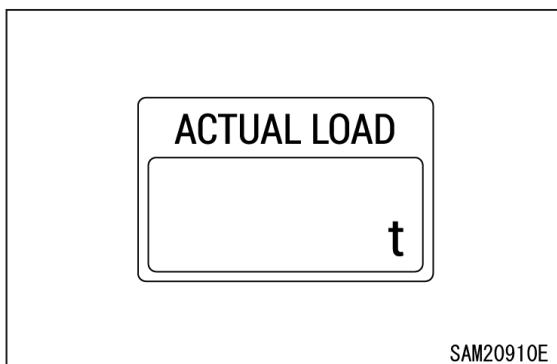
The load factor state of the moment limiter load is lit up on the bar according to the load factor change.

- Load factor display 100 - 110 (load factor 100% or more): red
- Load factor display 90 (load factor 90 - less than 100%): yellow
- Load factor display 0 - 80 (load factor less than 90%): green

**[2] ACTUAL LOAD DISPLAY (2)**

Continually displays the actual load of the hoisted load during crane operations.

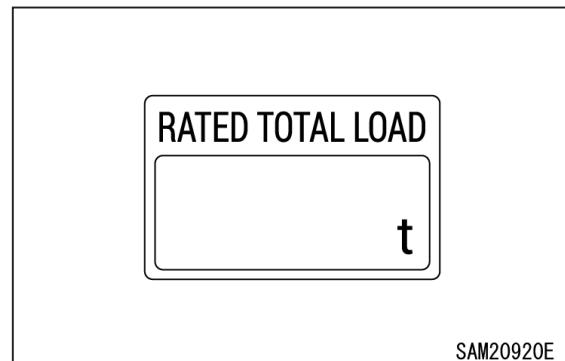
The actual load equals the total weight of the hook, hoisting attachment, and hoisted load. When no load is hoisted, it is normal that "0.0" To "0.1" Is displayed. Contact us or our sales service agency if outside this range.



- ☞ Due to the structure of load detection, a numerical value of actual load display changes when the boom is raised and lowered. Although the numerical value of the actual load changes on a higher side when boom raising operation is performed, this is not a fault.
- ☞ When the crane stops, the numerical value of actual load display changes if there is slewing of load.

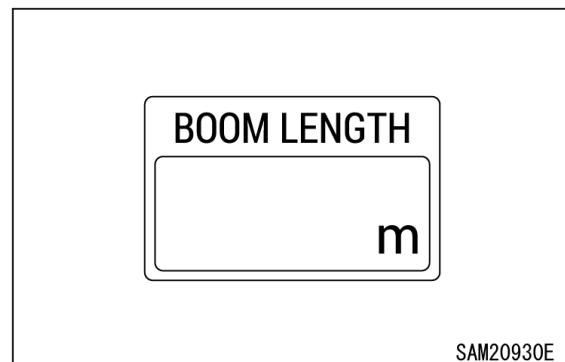
[3] RATED TOTAL LOAD DISPLAY (3)

The rated total load (i.E. Total weight of hook, hoisting attachment, and hoisted load) which the crane can currently hoist is displayed. It is calculated according to the conditions including the number of falls of the hook and the working radius.

**[4] BOOM LENGTH DISPLAY (4)**

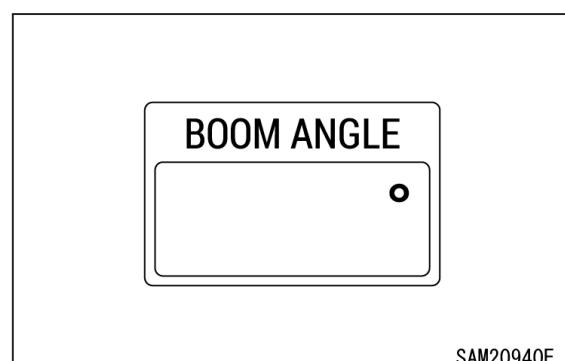
The current boom length is continually displayed during crane operations.

The boom length refers to the distance from the base pin of the boom to the sheave pin of the tip boom.

**[5] BOOM ANGLE DISPLAY (5)**

The current boom angle is continually displayed during crane operations.

The boom angle refers to the angle between the boom and horizontal line.



[6] MAXIMUM LIFTING HEIGHT ABOVE GROUND DISPLAY (6)

Continually displays the maximum lifting height above ground for the current boom status during crane operations.

Lifting height above ground refers to the vertical distance from the ground to the bottom of the hook.

☞ The height lifted above ground does not indicate the current hook position.

Indicates the height lifted above ground when the hook has been hoisted up to the overwinding position detection.



SAM20950E

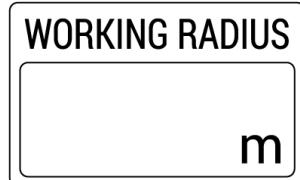


SAM20970E

[7] WORKING RADIUS DISPLAY (7)

The current working radius is continually displayed during crane operations.

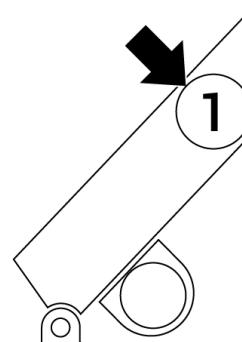
The working radius refers to the horizontal distance from the centre of slewing of the crane to the centre of the hook.



SAM20960E

[9] BOOM SECTION DISPLAY(9)

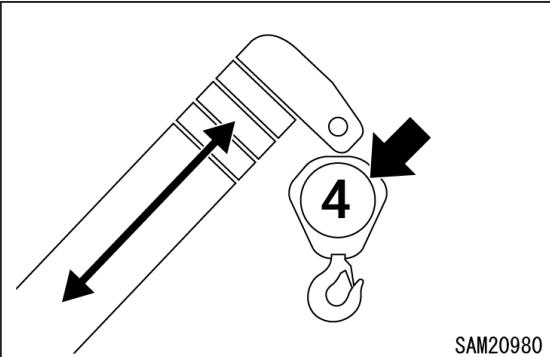
Displays the current number of boom sections when the crane is being operated.



SAM20990

[10] NUMBER OF FALLS DISPLAY (10)

Displays the current number of falls when the crane is being operated.



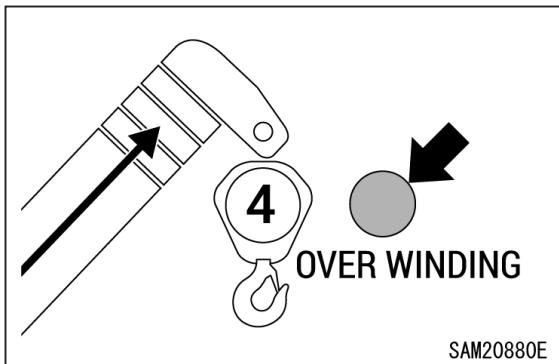
SAM20980

[8] SLEWING ANGLE DISPLAY (8)

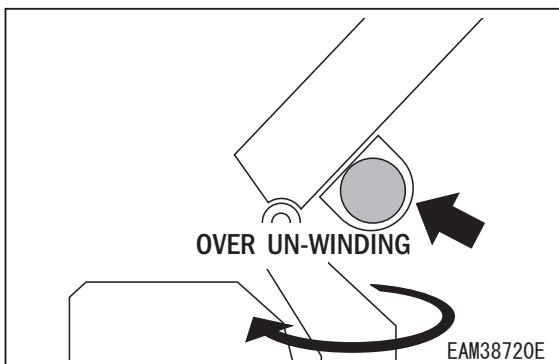
Displays the current slew angle when the crane is being operated.

[11] OVERWINDING DISPLAY (11)

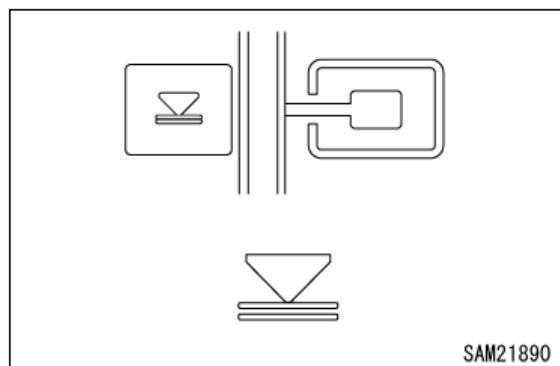
The red light flashes if the hook is in overwinding condition during crane operations. The green light lights up only if the overwinding detector is disabled while using the searcher hook.

**[12] OVER UN-WINDING STOP DISPLAY (12)**

If the length of wire unwound from the winch drum exceeds the maximum value while hoisting down the hook during crane operations, unwinding will stop automatically, and the red light will flash.

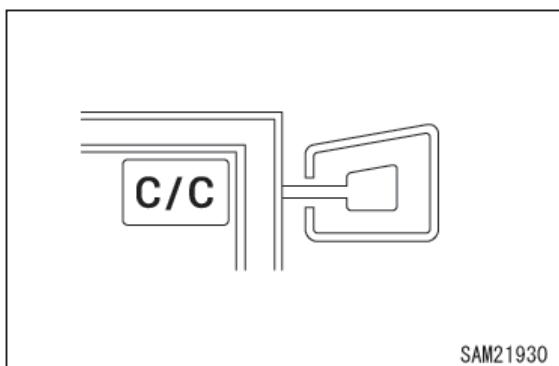
**[13] LIFTING HEIGHT UPPER LIMIT SWITCH (13), LIFTING HEIGHT UPPER LIMIT DISPLAY (18), BOOM ANGLE UPPER LIMIT/LOWER LIMIT SWITCH (14), BOOM ANGLE UPPER LIMIT/LOWER LIMIT DISPLAY (19), BOOM ANGLE LOWER LIMIT DISPLAY (20), WORKING RADIUS UPPER LIMIT SWITCH (15), WORKING RADIUS UPPER LIMIT DISPLAY (21), SLEWING ANGLE LIMIT SWITCH (16) CLOCKWISE (RIGHT) SLEWING ANGLE LIMIT DISPLAY (22), COUNTERCLOCKWISE (LEFT) SLEWING ANGLE LIMIT DISPLAY (23)**

Operating limits can be set in cases in which the operating range is restricted by moving the boom to the actual operating range limit to be set and holding down the corresponding switch. The display changes from blue to orange when set.

**[14] SETTING CHECK/CANCELLING SWITCH (17)**

- You can check the operating range limit currently set. Pressing the switch displays the setting for approximately 5 seconds.

- You can clear all operating range limit settings. Hold down the switch to clear all settings.



4.1.9.5 MOMENT LIMITER WORKING RANGE SETTING

⚠ WARNING

The following safety messages address a potential Tip Hazard when using the moment limiter working range:

- Always set the working range a safe distance from obstacles. Verify the boom will stop at the set position of the working range before operating the crane.
- Always operate the crane at a low engine speed. Do not operate the engine at any speed other than low. Operating at any engine speed other than low may cause the boom to travel beyond the set position of the working range.

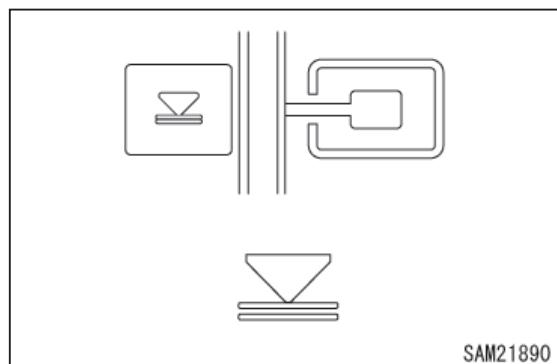
If the boom working range is limited due to a restricted working space, the boom working range can be set to a desired value.

- ☞ The display colours corresponding to the various limit states are as follows:

- Blue:
No limit setting
- Yellow:
Limit setting conditions currently selected
(Reverts to blue or orange if no operation is performed within five seconds.)
- Orange:
Limit set

[1] SETTING OR CANCELLING THE UPPER LIMIT VALUE OF LIFTING HEIGHT

While the lifting height limit is imposed by detecting the boom tip height, the monitor displays the maximum height when the hook is hoisted up to the overwinding detected position. When the boom is in the precaution alarm range or upper limit stop position in a condition in which the hook height is set, the monitor display lights up in orange.



- Setup

Set the boom to the desired maximum height in a condition in which no upper limit value is set, and press and hold the switch.

The monitor display changes to the orange colour and the maximum height is set as the upper limit value.

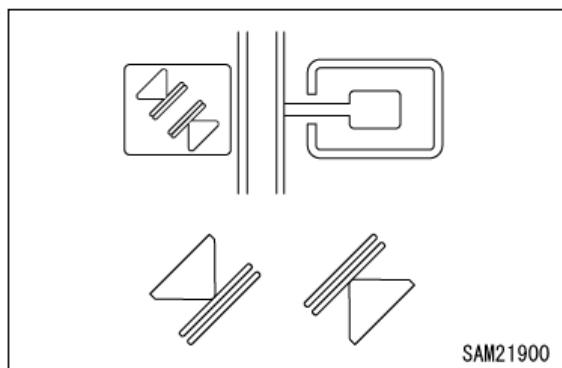
- ☞ Be sure to check, before actual work, that the boom automatically stops at the set hook height. If the boom does not automatically stop, reset the hook height in the above steps.
- ☞ When the boom is in the precaution alarm range or upper limit stop position, an alarm sounds intermittently only if raising operation or extension operation is performed.
- ☞ The set value is memorised when the starter switch is turned to the "OFF" position.

- Cancel

Press and hold the switch in a condition in which the upper limit value is set. The monitor display changes to the blue colour and the upper limit value setting is cancelled.

[2] SETTING OR CANCELLING THE BOOM ANGLE UPPER LIMIT VALUE/LOWER LIMIT VALUE

When the boom is in the precaution alarm range or upper limit stop position in a condition in which the boom angle upper limit or lower limit is set, the monitor display lights up in orange.



- Setup

Set the boom to the desired angle in a condition in which no upper limit value and lower limit value are set, and press the switch. The yellow display appears and the upper limit and lower limit can be selected. Each time the switch is pressed, the upper limit and lower limit change. Select the yellow indicator for the direction to be cleared and hold the switch.

The upper limit value on the monitor display changes to the orange colour and the boom angle is set as the upper limit value or lower limit value.

☞ Be sure to check, before actual work, that the boom automatically stops at the set angle. If the boom does not automatically stop, reset the boom angle in the above steps.

☞ An alarm sounds intermittently when the boom, which is in the upper limit, is in the precaution alarm range or upper limit stop position and only if the raising operation is performed, and when the boom, which is in the lower limit, is in the precaution alarm range or lower limit stop position and only if the lowering operation is performed.

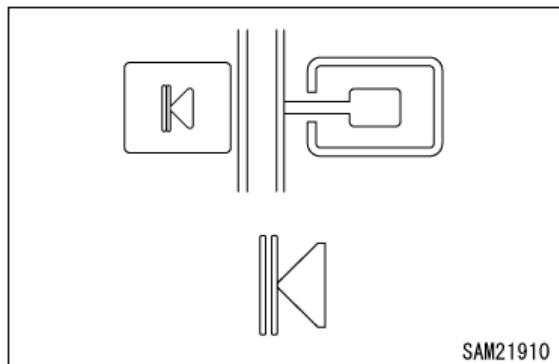
☞ The set value is memorised when the starter switch is turned to the "OFF" position.

- Cancel

Press the switch in a condition in which the upper limit value or lower limit value is set. The orange display section can be selected in yellow. Each time the switch is pressed, the selection changes. Select the yellow indicator for the direction to be cleared and hold the switch. The monitor display changes to the blue colour and the upper limit value or lower limit value setting is cancelled.

[3] SETTING OR CANCELLING THE UPPER LIMIT VALUE OF THE WORKING RADIUS

When the boom is in the precaution alarm range or upper limit stop position in a condition in which the working radius upper limit is set, the monitor display lights up in orange.



- Setup

Set the boom to the desired working radius in a condition in which no upper limit value is set, and press and hold the switch.

The upper limit value on the monitor display changes to the orange colour and the working radius is set as the upper limit value.

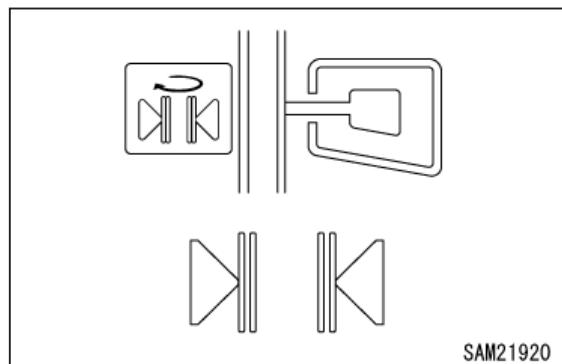
- ☞ Be sure to check, before actual work, that the boom automatically stops at the set working radius. If the boom does not automatically stop, reset the working radius in the above steps.
- ☞ When the boom is in the precaution alarm range or upper limit stop position, an alarm sounds intermittently only if lowering operation or extension operation is performed.
- ☞ The set value is memorised when the starter switch is turned to the “OFF” position.

- Cancel

Press and hold the switch in a condition in which the upper limit value is set. The monitor display changes to the blue colour and the upper limit value or lower limit value setting is cancelled.

[4] SETTING/RESETTING SLEWING ANGLE LIMITS

When the slewing angle is in the advance warning area or at the stop position in a condition in which the slewing angle limit is set, the monitor display lights up in orange.



- Setup

Slew the boom to the desired angle in a condition in which no slewing angle limit is set, and press the switch. Once the switch is pressed, the yellow display appears and clockwise (right) or counterclockwise (left) slewing can be selected. Each time the switch is pressed, the slewing direction changes.

Select the yellow indicator for the direction to be set, and hold the switch.

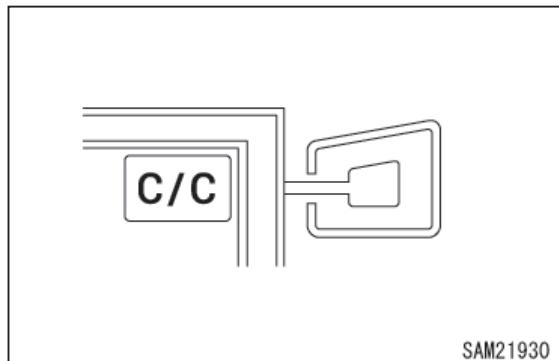
The angle limit value on the monitor display changes to the orange colour and the slewing angle is set as the limit value.

- ☞ Be sure to check, before actual work, that the boom automatically stops at the set working radius. If the boom does not automatically stop, reset the working radius in the above steps.
- ☞ If the clockwise (right) slewing angle limit has been set, the alarm sounds intermittently only if the boom slews clockwise (right) or stopped in the advance warning area, and if the counterclockwise (left) slewing angle limit has been set, the alarm sounds intermittently only if the boom slews counterclockwise (left) or stopped in the advance warning area.
- ☞ The set value is memorised when the starter switch is turned to the “OFF” position.

- Cancel

Press the switch in a condition in which the slewing angle is set. The orange display section can be selected in yellow. Each time the switch is pressed, the selection changes. Select the yellow indicator for the direction to be cleared, and hold down the switch. The monitor display changes to blue, indicating that the slewing angle limit setting has been cleared.

[5] SETTING CHECK/CANCELLING



- Check setting

Use this switch to verify the values set. Press this switch. Every time the switch is pressed, the set value will be displayed. The boom angle upper limit will be displayed on the boom length display.

- Cancel setting

Use this switch to cancel the all setting sets. Press this switch and "CHECK" switch at the same time for 5 seconds or more. The all value sets will be cancelled.

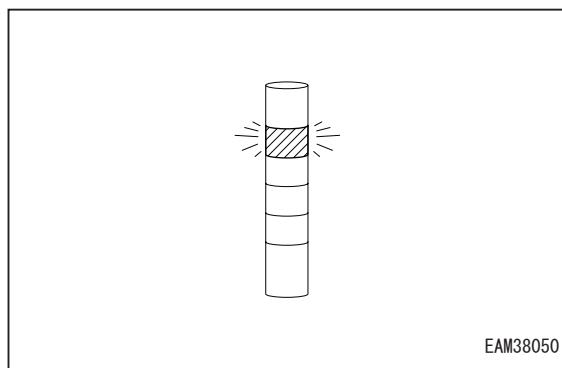
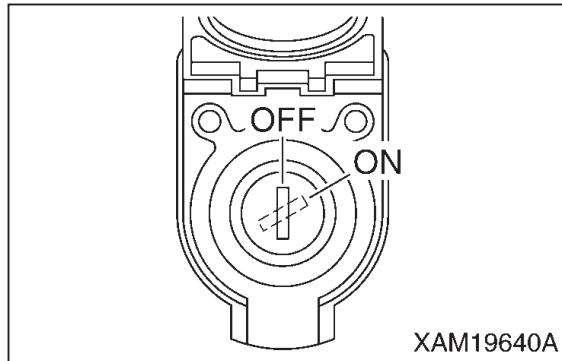
- When this switch is turned to the "ON" position (override), all the moment limiter's interlocked automatic safety/stop /limit features become inactive & disabled. All crane operations in this situation are unprotected by the moment limiter system.
- The risk of a crane accident increases greatly without the use of the moment limiter system. The moment limiter system is a safety aid to the operator, not a tool or excuse for poor and dangerous crane operation.
- With or without the protection of the moment limiter system, crane operation outside of the parameters of the rated total load chart(s), unsafe operations beyond accepted safe crane practices and proper crane operation technics may result in dropping of a hoisted load, breakage of crane components or the machine tip-over. A serious accident resulting in death or serious injury may occur.
- Do not store the override key permanently in the moment limiter override switch box.

4.1.9.6 MOMENT LIMITER OVERRIDE SWITCH

⚠ WARNING

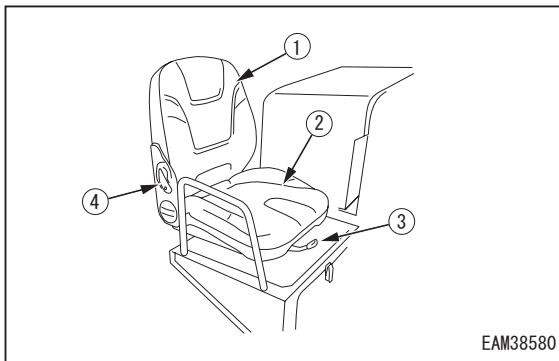
- The moment limiter override switch disables all safety features, all limits and all automatic stops of the moment limiter digital load safety system.

Use this switch only in the case of an emergency due to failure of the Moment Limiter system, and or machine maintenance / service when any crane travel, lifting operations are not being performed.



- The moment limiter override switch box is located inside the door under the operation seat.
- Key to “ON” position = override insert the override key into the moment limiter override switch box. Turn the key clockwise (right) to “on” position. (The spring-loaded switch automatically returns to the “OFF” position when you release the key). Now the system is in override. All safety features, all limits and all automatic stops of the moment limiter system are inactive & disabled for a total of 3 minutes.
- The moment limiter override switch box led light will light up solid for 2-1/2 minutes, then it will flash for the last 30 seconds of override.
- The working status light will flash red during override.
- The moment limiter warning alarm buzzer / alarm will sound continuously for 3 minutes.
- Crane functions boom extend, and boom lowering will be limited in speed to 20% of normal speed during override.
- To discontinue override, at any time under 3 minutes, turn the engine starter ignition key to off shutting down the machine. Restart the machine as normal, and the moment limiter system will commence with normal start up sequence.

4.1.10 OPERATION SEAT



- (1) Back seat
- (2) Seat
- (3) Slide adjusting lever
- (4) Reclining adjusting lever

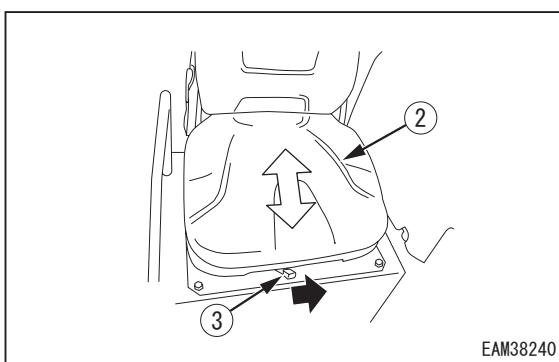
⚠ WARNING

- **Adjust the operation seat before operation. Be sure to make adjustment especially after someone else has used it.**
- **Press your back against the back seat of the operation seat and adjust the operation seat so that you can operate the acceleration pedal, control levers and travelling lever without any difficulty.**
- **Never adjust the operation seat while operating the machine.**

[1] SEAT FORWARD/BACKWARD SLIDE ADJUSTMENT

Use the slide adjusting lever (3) to make adjustment.

1. While pushing the slide adjusting lever (3) leftward, move the seat (2) forward/backward.



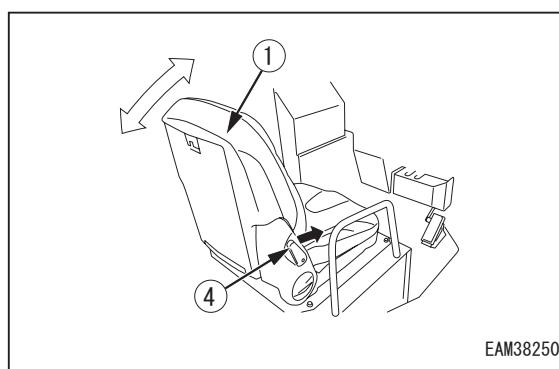
2. After adjusting the seat (2), release your hand from the slide adjusting lever (3). The seat (2) is fixed to the position.

☞ The forward/backward slide adjustment distance is 120 mm in 6 steps.

[2] RECLINING ADJUSTMENT

Use the reclining adjusting lever (4) to make adjustment.

1. While pushing the reclining adjusting lever (4) forward, move the backseat (1) forward/backward.



2. After adjusting the back seat (1), release your hand from the reclining adjusting lever (4).

The back seat (1) is fixed to the position.

☞ The reclining adjustment angle is 75 degrees in 7 steps forward and 23 steps in backward.

4.2 REMOTE CONTROL SYSTEM

4.2.1 INTENDED USE

This R/C device features a transmitter and a receiver.

The R/C device uses a wireless transmitter, enabling the crane to be operated remotely from any convenient location within radio range.

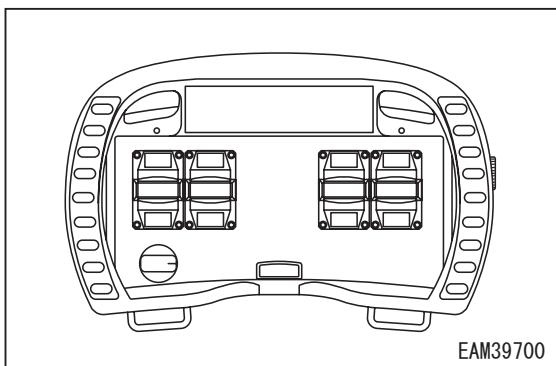
4.2.2 DEVICE CONFIGURATION

This device is to be used for the following operations.

[1] TRANSMITTER

The transmitter includes operation levers, a display, and an Emergency stop Switch (EMO), etc.

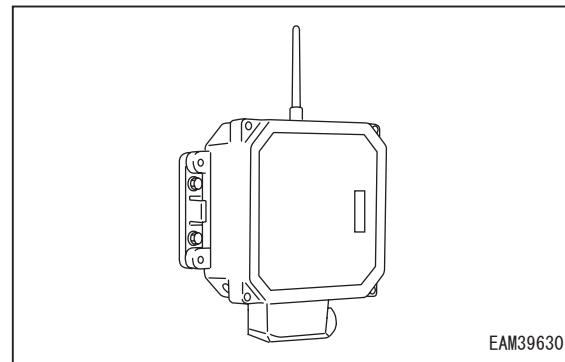
The transmitter transmits crane operation signals by radio to the receiver mounted on the machine body, enabling the crane to be operated remotely.



[2] RECEIVER

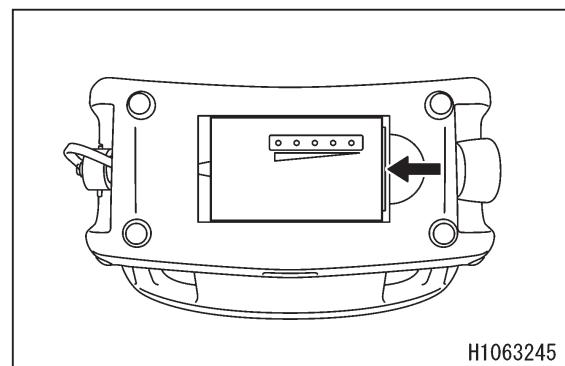
The receiver which is installed on the crane is equipped with control box, LED monitor, connector, antenna, etc.

The receiver receives operation signals from the transmitter and controls the crane.



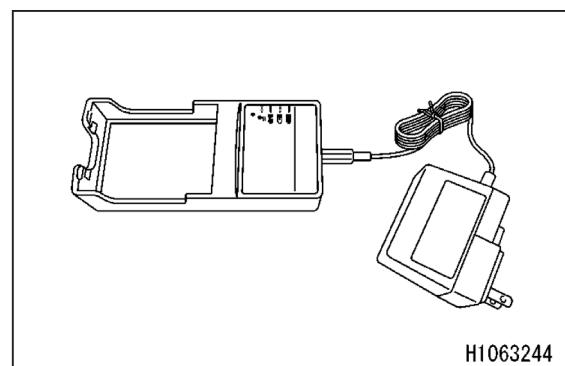
[3] BATTERY

This forms the power supply for the transmitter.



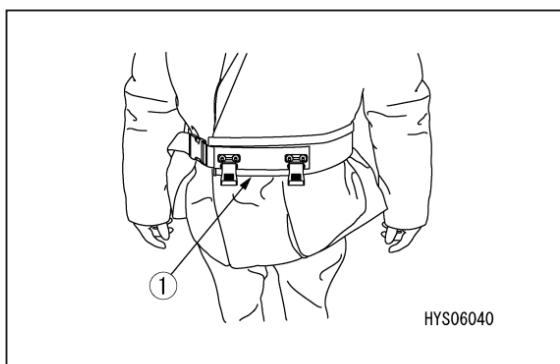
[4] BATTERY CHARGER

This is used to recharge the transmitter battery.



[5] WAIST BELT

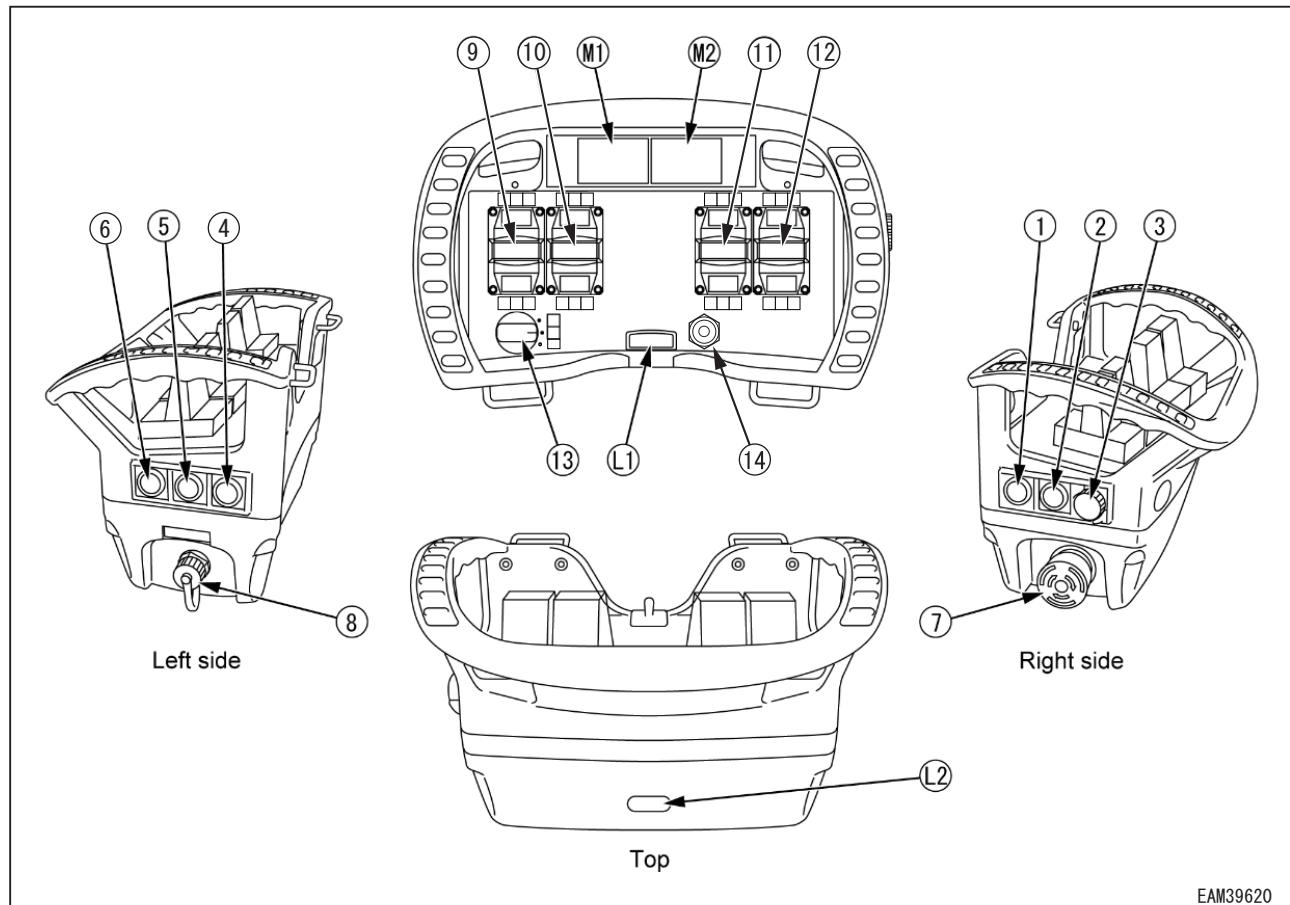
This is a belt used to hold the transmitter while it is being used.

**4.2.2.1 DEVICE FUNCTIONS**

- The crane operation speed can be controlled by the operator from stationary to maximum speed using the engine speed and control levers.
- The R/C device transmitter can be used to start and stop the engine, move the crane, operate the crane, and operate optional devices fitted to the crane.
- The crane cannot be operated manually from the machine itself while the R/C device transmitter is turned on. This prevents erroneous operation or malfunctions due to multiple operation signals.
- The R/C device features an emergency stop function to stop the crane in an emergency.
- This R/C device includes the ID data necessary for operating the transmitter.
- This R/C device automatically searches for unused frequencies.
- The engine cannot be started up using the R/C device transmitter if communication is not established when the power is turned on.
- If communication is interrupted during operation (due to poor reception or being out of radio range, for example), crane operation stops and the display indicates that radio communication has been lost to prevent erroneous operation or malfunctions.

4.2.3 REMOTE CONTROL SYSTEM COMPONENTS

4.2.3.1 TRANSMITTER



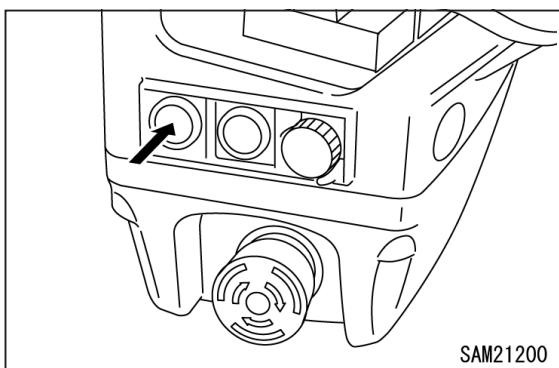
EAM39620

(1) Transmitter power switch	(10) No.2 outrigger/boom telescoping operation lever
(2) Engine start/stop switch	(11) No.3 outrigger/winch operation lever
(3) Display operation switch	(12) No.4 outrigger/boom derricking operation lever
(4) Horn switch	(13) Operation mode selector switch
(5) Boom lift bypass switch	(14) Hook stowage/boom stowage switch
(6) Speed selector switch	(L1) LED light (front)
(7) Emergency stop(EMO)/remote control power OFF switch	(L2) LED light (control panel)
(8) Cable connection port (Not used)	(M1) Left display
(9) No.1 outrigger/boom slewing operation lever	(M2) Right display

[1] TRANSMITTER POWER SWITCH(1)

Use this switch to turn on transmitter power.

- Standby: Press the switch once to select Standby mode. Power will shut off automatically after a few seconds in standby mode.
- Power ON: Press the switch three times while in Standby mode to turn on transmitter power.

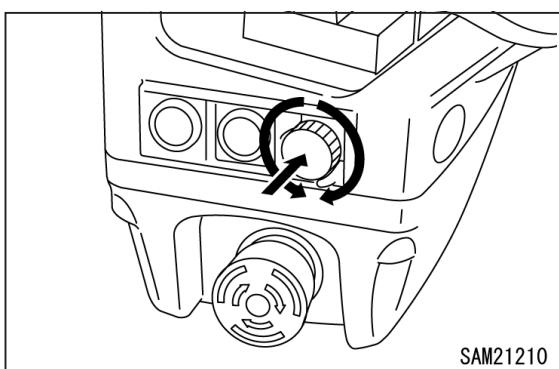
**[2] ENGINE START/STOP SWITCH(2)**

Use this switch to start/stop the engine.

[3] DISPLAY OPERATION SWITCH(3)

Use this switch to operate the display.

- Select: Rotate the switch to select from the menu.
- Enter: Press the switch to enter a selection.

**[4] HORN SWITCH(4)**

The horn sounds while this switch is pressed.

[5] BOOM LIFT BYPASS SWITCH(5)

The boom can be lifted while this switch is pressed following an overload stop.

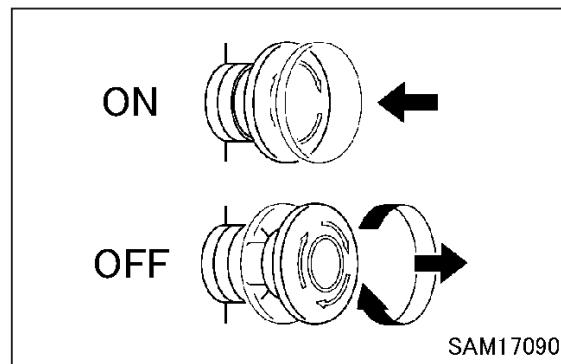
[6] SPEED SELECTOR SWITCH(6)

Used to operate the crane at micro speed or high speed when operating the crane.

[7] EMERGENCY STOP(EMO)/REMOTE CONTROL POWER OFF SWITCH(7)

Use this switch to bring the engine to an emergency stop. In addition, this switch can be used to turn off the remote control system.

- ON: Turns off transmitter power and shuts down the engine.
- OFF: Allows transmitter power to be turned on. Power cannot be turned on while this switch is ON.

**[8] CABLE CONNECTION PORT (NOT USED)(8)**

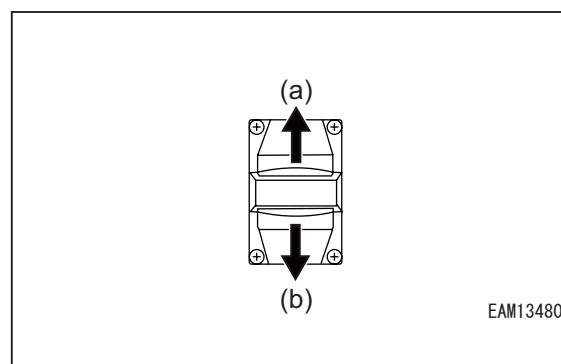
Not used with this machine.

[9] NO.1 OUTRIGGER/BOOM SLEWING OPERATION LEVER(9)

Used for individual outrigger and crane operations

For more information on outrigger operations, see “5.3.2.4 OUTRIGGER OPERATION.”

For more information on crane operations, see “5.3.2.5 CRANE OPERATION.”



This operation lever is used in the following ways:

- In crane mode
 - (a) Boom counter-clockwise slewing
 - (b) Boom clockwise slewing

- In the outrigger lifting and grounding mode
 - (a) No. 1 outrigger lifted
 - (b) No. 1 outrigger grounded
- In the outrigger extension mode
 - (a) No. 1 outrigger retracts
 - (b) No. 1 outrigger extends

**[10] NO.2 OUTRIGGER/BOOM
TELESCOPING OPERATION
LEVER(10)**

This operation lever is used in the following ways:

- In crane mode
- (a) Extending the boom
- (b) Retracting the boom
- In the outrigger lifting and grounding mode
 - (a) No. 2 outrigger lifted
 - (b) No. 2 outrigger grounded
- In the outrigger extension mode
 - (a) No. 2 outrigger retracts
 - (b) No. 2 outrigger extends

**[11] NO.3 OUTRIGGER/WINCH OPERATION
LEVER(11)**

This operation lever is used in the following ways:

- In crane mode
- (a) Winch hoisting down
- (b) Winch hoisting up
- In the outrigger lifting and grounding mode
 - (a) No. 3 outrigger lifted
 - (b) No. 3 outrigger grounded

- In the outrigger extension mode
 - (a) No. 3 outrigger retracts
 - (b) No. 3 outrigger extends

**[12] NO.4 OUTRIGGER/BOOM DERRICKING
OPERATION LEVER(12)**

This operation lever is used in the following ways:

- In crane mode
- (a) Lowering the boom

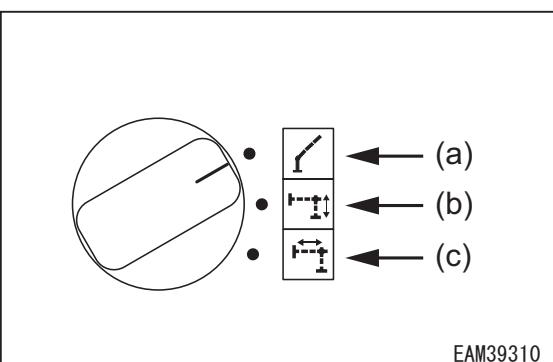
- (b) Raising the boom

- In the outrigger lifting and grounding mode
 - (a) No. 4 outrigger lifted
 - (b) No. 4 outrigger grounded
- In the outrigger extension mode
 - (a) No. 4 outrigger retracts
 - (b) No. 4 outrigger extends

**[13] OPERATION MODE SELECTOR
SWITCH(13)**

Used to switch between Outrigger mode and Crane mode.

- Crane (a): Allows the crane to be operated using levers.
- Outrigger lifting and grounding (b): Allows lifting and grounding of outriggers to be operated using levers.
- Outrigger extension (c): Allows extension of the outriggers to be operated using levers.



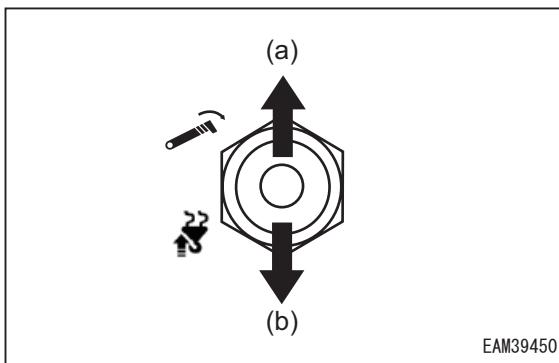
**[14] HOOK STOWAGE/BOOM STOWAGE
SWITCH(14)**

⚠ WARNING

The hook stowage switch disables the automatic stop function of the overwinding prevention device to wind up the hook block. When stowing the hook block, press the switch downward carefully and be sure not to allow the hook block to crash into the boom.

Used when stowing the hook or the boom

For more information on stowage procedures, see "5.2.23 CRANE STOWING OPERATION."



- (a) Boom stowage switch turned on
- (b) Hook stowage switch turned on

**[15] LED LIGHT (FRONT)(L1)
LED LIGHT (CONTROL PANEL)(L2)**

Turns on the LED lights to light up the surrounding area.

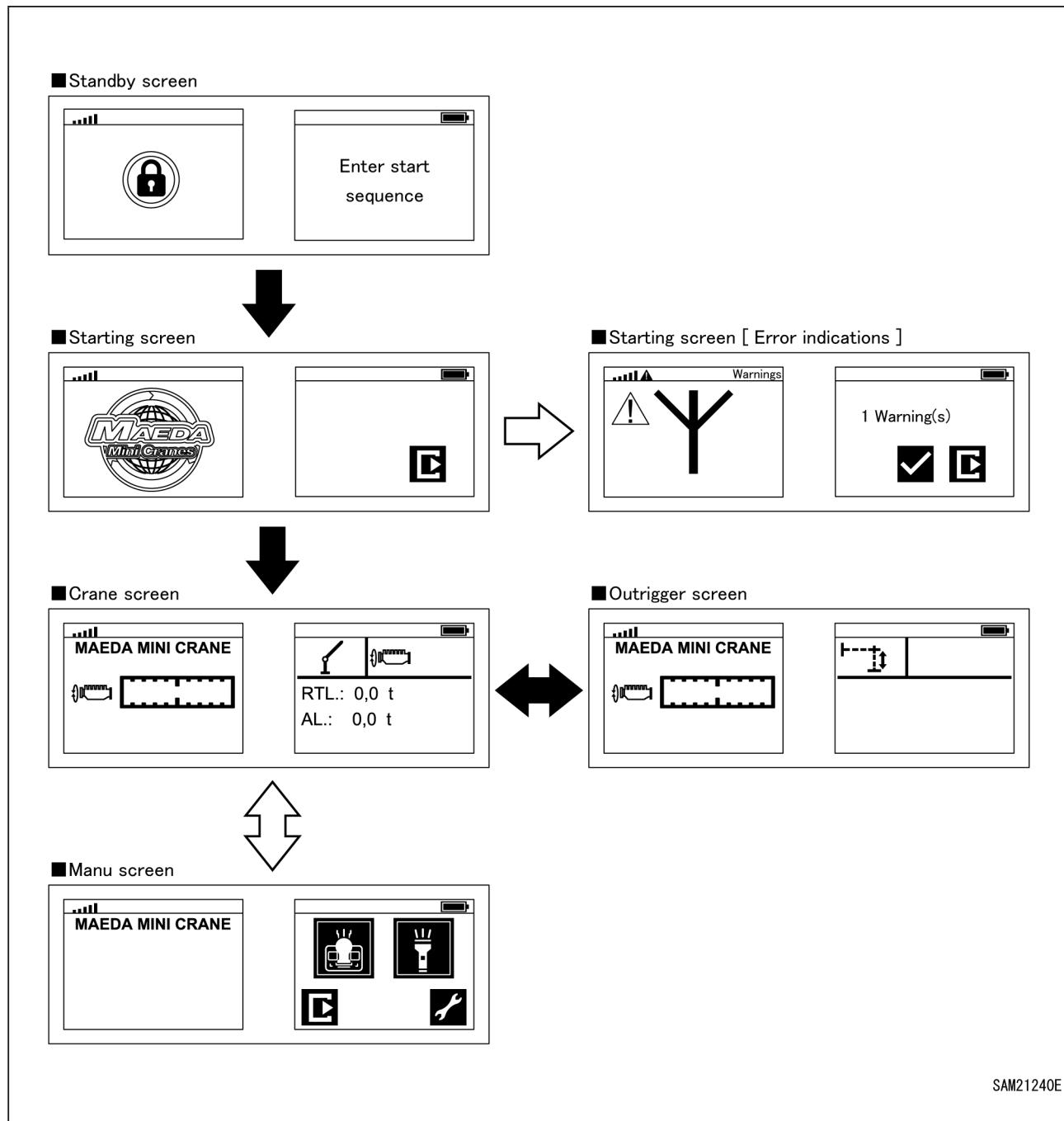
For more information on turning on the lights, see "4.2.3.2 TRANSMITTER DISPLAY COMPONENTS."

**[16] LEFT DISPLAY(M1)
RIGHT DISPLAY(M2)**

Use this display to view various kinds of information.

For more information on display, see "4.2.3.2 TRANSMITTER DISPLAY COMPONENTS."

4.2.3.2 TRANSMITTER DISPLAY COMPONENTS



[1] STANDBY SCREEN

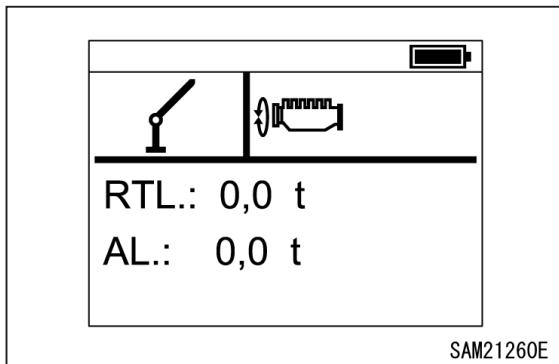
Press the Power Switch on the transmitter to display the Standby screen.
The remote control system is still locked at this point.

[2] STARTING SCREEN

Hold down the Power Switch on the transmitter while the Standby screen is displayed to turn on power and switch to the Starting screen.

[3] CRANE/OUTRIGGER SCREEN

The operation mode selector switch also changes the screen displayed.
In the either case, the left screen displays the accelerator gauge. The gauge indication varies depending on how far the lever is moved.
The right display varies as follows for each of the screens:

**[Crane Screen]**

The crane symbol is displayed. The rated total load and actual load are also displayed.

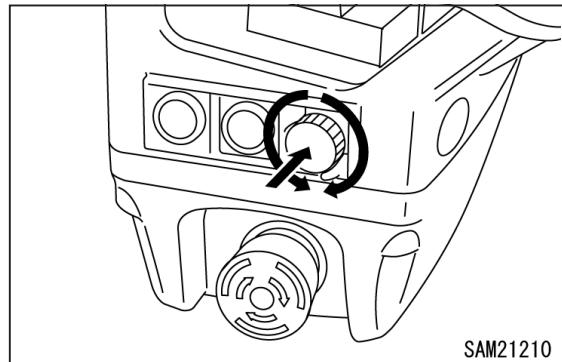
- RTL: Indicates the rated total load.
- AL: Indicates the actual load.

[Outrigger Screen]

The outrigger symbol is displayed. No particular status indications are displayed here.

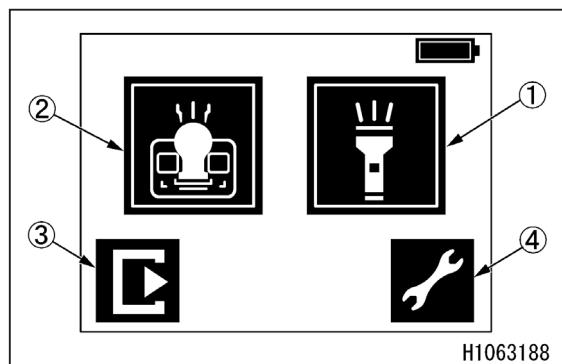
[4] MENU SCREEN

Press the Display Operation Switch while the Crane Screen or Outrigger Screen is displayed to switch to the Menu Screen.



Turning the display operation switch allows you to select a desired menu.

Select a menu on the display, and press the display operation switch to determine the menu.



(1) LED light (front) ON/OFF

(2) LED light (operation panel) ON/OFF

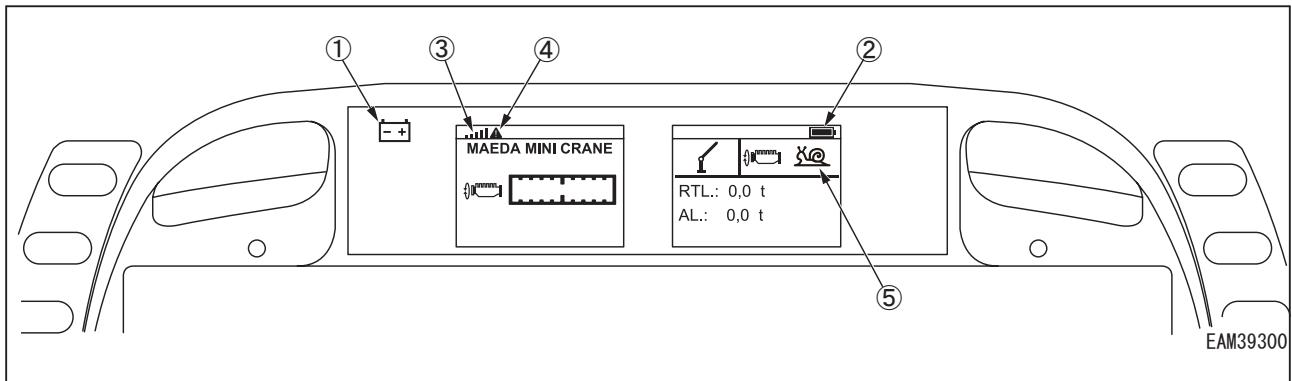
(3) Move to the crane/outrigger screen

(4) Move to remote control menu

[Remote control menu list]

Symbol	Name	Description
	HBC Menu	This menu can configure system settings, connection settings, and security settings and can display various information.
	Warnings	This submenu can be used to display warnings.
	Information	This submenu can be used to display the system information.
	Service address	This menu item can be used to display the hotline phone number and email address of our service office.
	Working hours	This menu item can be used to display the current working hours.
	Software/config	This menu item can be used to display the currently installed software version and the current display configuration.
	Information text	This menu item can be used to display the currently entered information text.
	Back	This soft key allows you to navigate through menu items to return to the previous item.
	Power info	This submenu can be used to display information about the remaining battery power.
	Battery level	This menu item can be used to display the current battery level.
	Back	This soft key allows you to navigate through menu items to return to the previous item.
	Personalize	This submenu allows you to personalize the system settings.
	Language	This menu item allows you to choose the display language.
	Backlight	This menu item can be used to adjust the backlight brightness of the display.
	Back	This soft key allows you to navigate through menu items to return to the previous item.
	Connections	This submenu allows you to configure connection settings.
	Display configuration	This menu item allows you to configure the connection to PC.
	RF connection	This menu item allows you to establish the HF interface.
	Back	This soft key allows you to navigate through menu items to return to the previous item.
	Settings	This submenu allows you to configure device settings.
	Set information text	This menu item allows you to enter information texts.
	Master level	This menu item allows you to enable/disable the access to the master level.
	Back	This soft key allows you to navigate through menu items to return to the previous item.
	Safety functions	This submenu allows you to configure security settings.
	Safety features	This menu item allows you to adjust the sensitivity for radiomatic® zero-g and radiomatic® shock-off, which are provided to enhance security features.
	inclination switch	This menu item allows you to configure the settings for radiomatic® inclination switch, which is provided to enhance security features.
	APO/AMO	This menu item allows you to configure APO/AMO for the security features.
	Manage PIN	This menu item allows you to change the PIN from the current PIN to a new PIN.
	Reset PIN	This menu item allows you to reset the current PIN.
	Back	This soft key allows you to navigate through menu items to return to the previous item.
	Home	This soft key allows you to return to the main page of the customer menu.

4.2.3.3 STATUS INDICATIONS OF DISPLAY



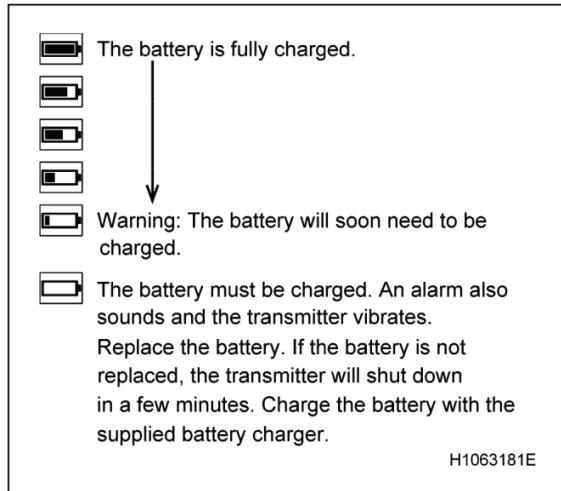
- (1) Battery icon
- (2) Battery level icon
- (3) Radio wave status bar
- (4) Error icon
- (5) Micro speed / high speed icon

[1] BATTERY ICON (1)

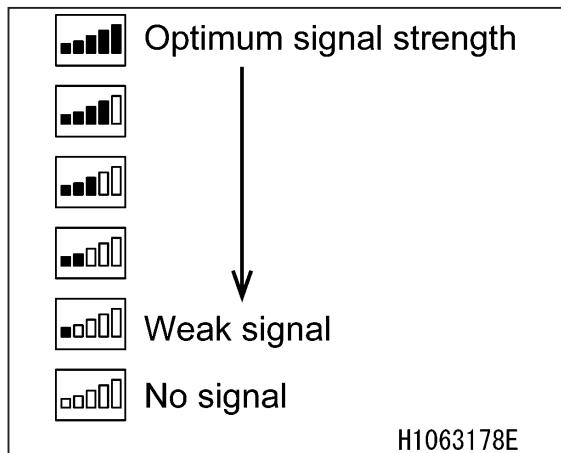
Flashes in green when the power supply is in normal condition.

[2] BATTERY LEVEL ICON (2)

Indicates the remaining battery level as follows:

**[3] RADIO WAVE STATUS BAR (3)**

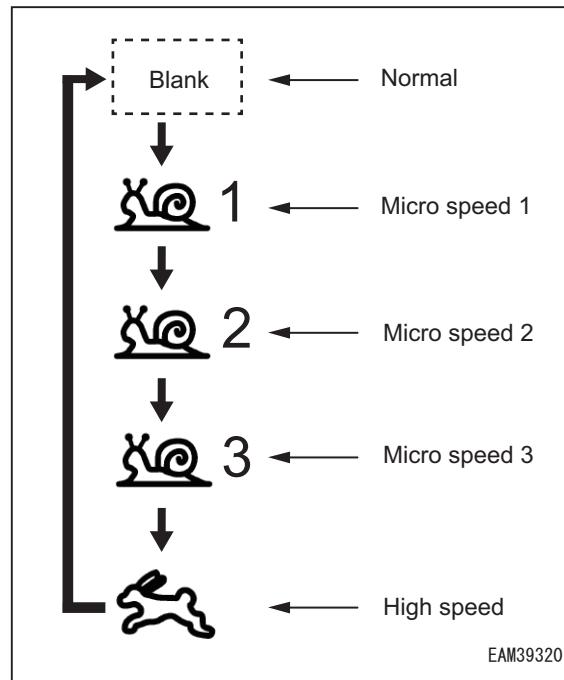
The intensity of radio waves are as follows:

**[4] ERROR ICON (4)**

An icon appears when an error is detected. Detailed information about the error icons can be checked from the remote control menu in the configuration menu.

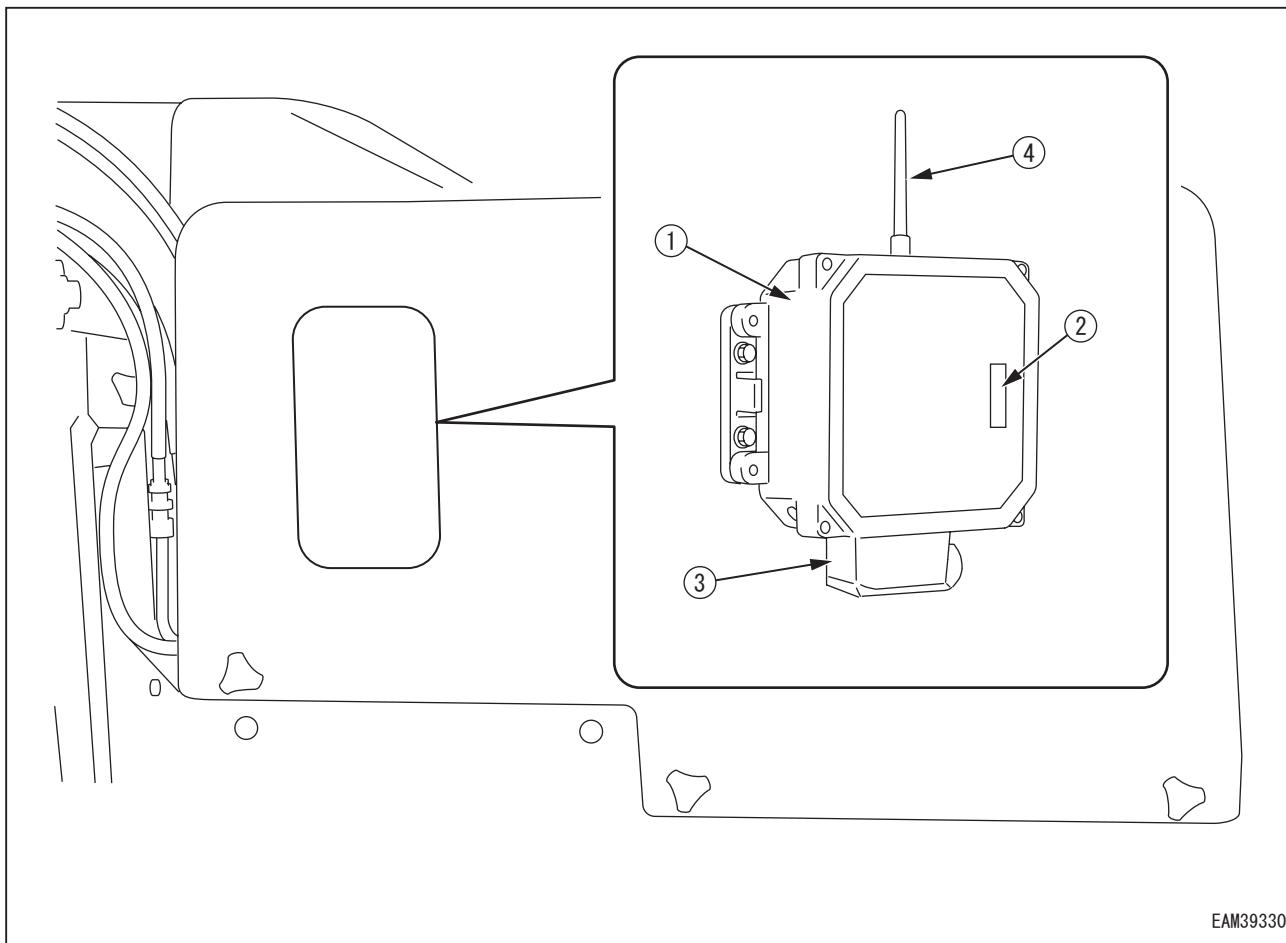
[5] MICRO SPEED / HIGH SPEED ICON (5)

Displays the operation speed that has been selected - micro speed 1, micro speed 2, micro speed 3 or high speed.



- Micro speed: micro speed is selected.
- High speed: high speed is selected.

4.2.3.4 RECEIVER



(1) Receiver
(2) LED Monitor

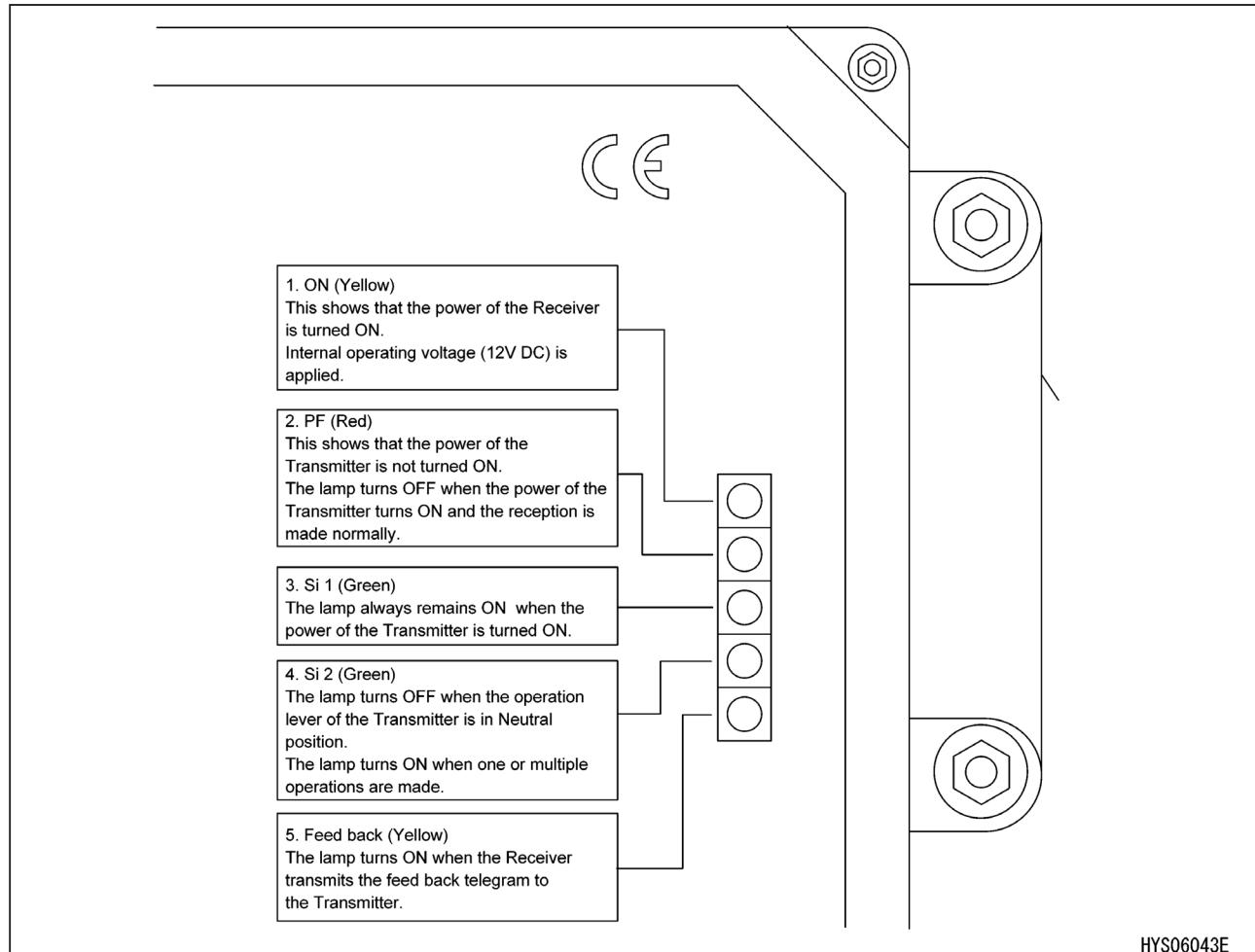
(3) Radio controller cable connection port
(4) Antenna

[1] RECEIVER (1)

The control box contains the receiver and control devices. Do not dismantle the control box.

[2] LED MONITOR (2)

The control box is equipped with LED monitors that show the operation status of the remote control system.



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[3] RADIO CONTROLLER CABLE CONNECTION PORT (3)**⚠ WARNING**

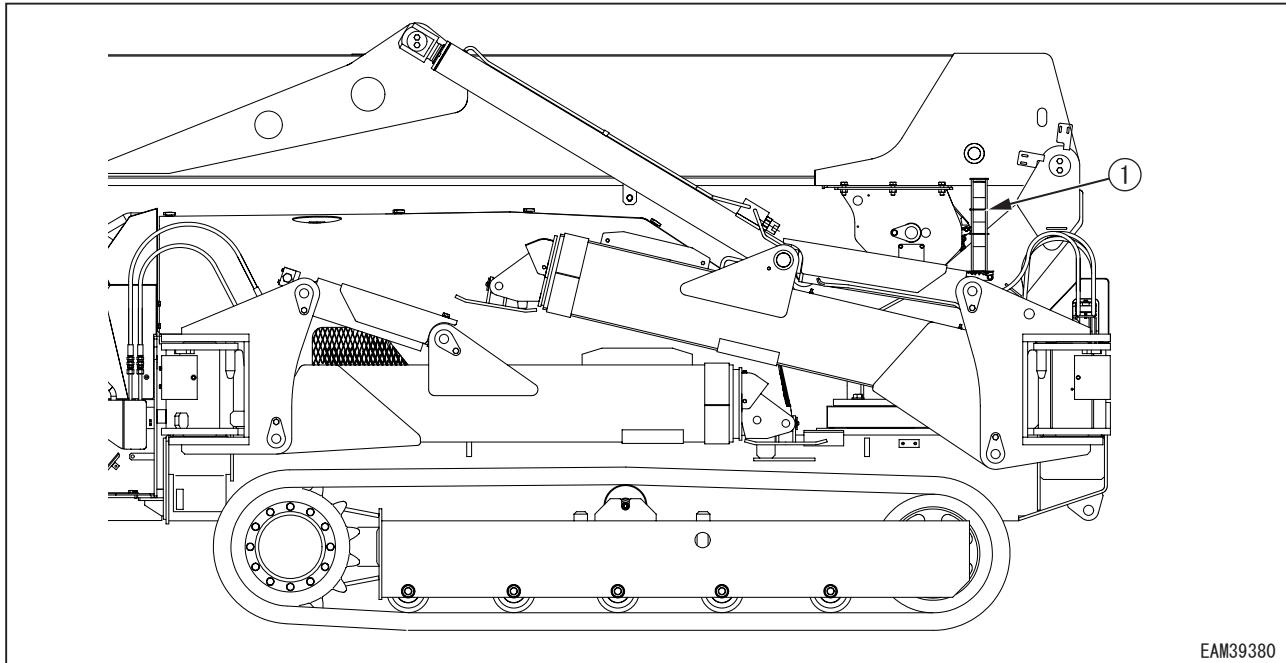
Before performing electric welding due to repair work for the machine body or other reasons, be sure to disconnect the wire. Failure to do so may result in a machine failure caused by burn damage to the control box due to high voltage applied to it.

This is used when the transmitter and the receiver are connected with a radio controller cable.

[4] ANTENNA (4)

Antenna that allows communication with the transmitter of the remote control system.

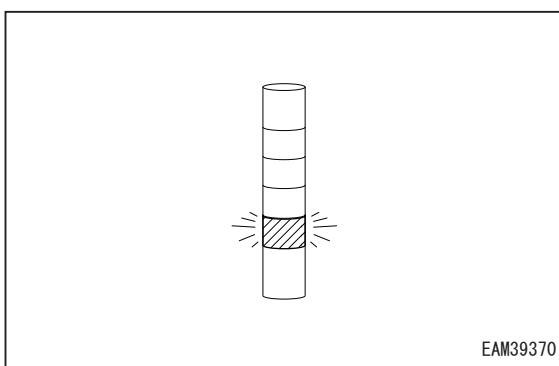
4.2.3.5 RADIO REMOTE CONTROL LAMP



(1) Working status lamp

[1] WORKING STATUS LAMP(1)

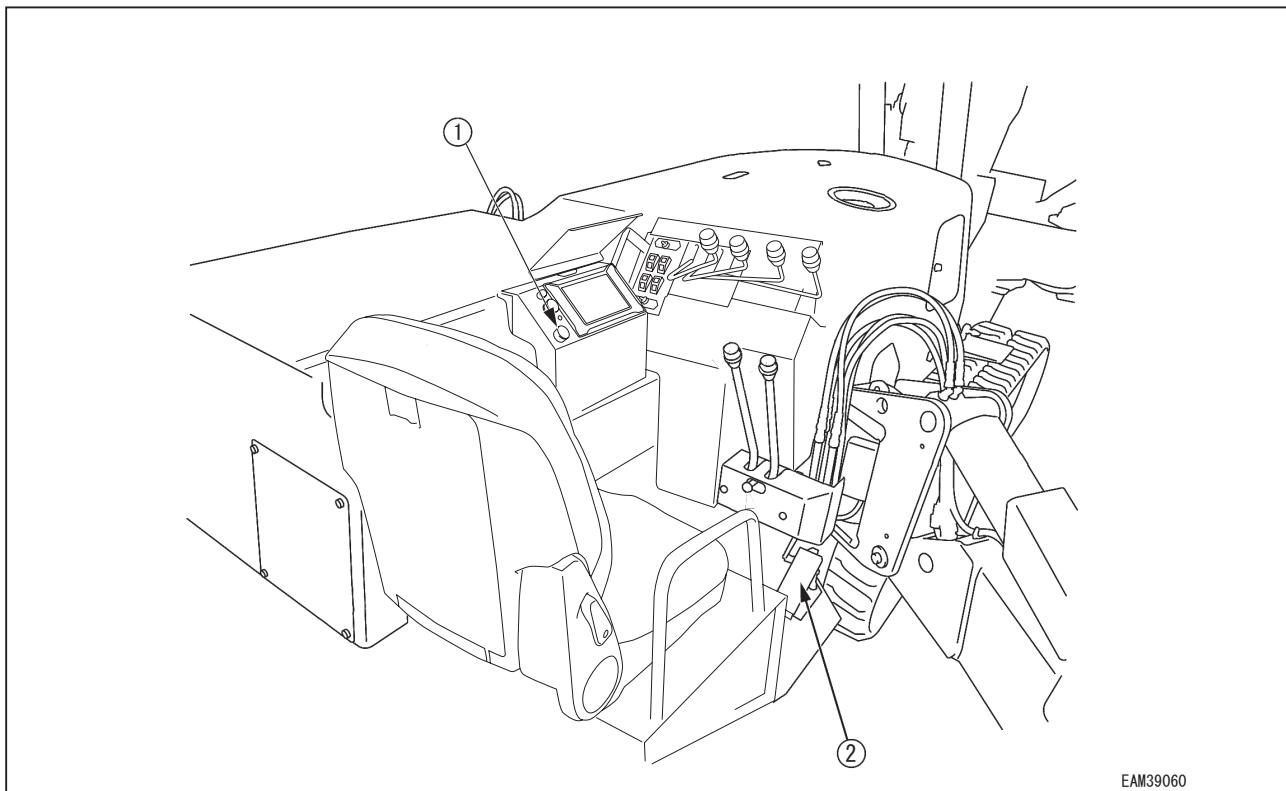
When the transmitter and receiver are communicating, the working status lamp (blue) lights up.



4.3 ELECTRIC MOTOR (OPTION)

4.3.1 COMPONENT

4.3.1.1 TRAVEL AND CRANE CONTROLS



(1) Starter switch

(2) Acceleration Pedal

IMPORTANT

This section describes only switches that have different functions when using an electric motor as the power source. For more information on switches and operation levers not described here, refer to “4.1 COMPONENT NAMES.”

[1] STARTER SWITCH(1)

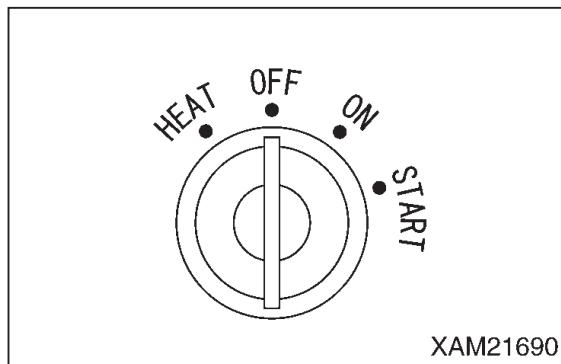
⚠ CAUTION

Always turn the starter switch to the “OFF” position after completing the work.

Use this switch to start and stop the electric motor.

- HEAT:
Not used
- OFF:
You can insert/remove the key at this position. All the switches in the electrical system are turned off and the electric motor stops.
- ON:
Electric circuits of the inverter unit are on.
- START:
When the electric motor starts, release the key. The key automatically returns to the ON position.

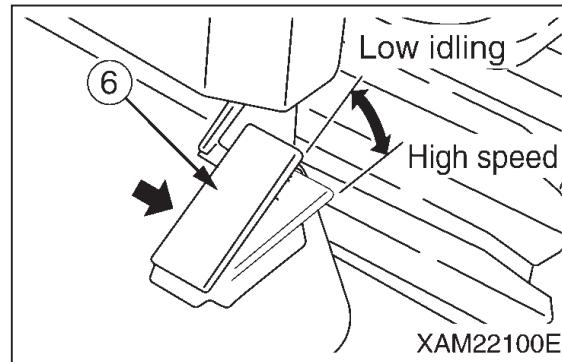
When the electric motor has started, release your hand from the key. The key automatically returns to the “ON” position.



[2] ACCELERATION PEDAL (2)

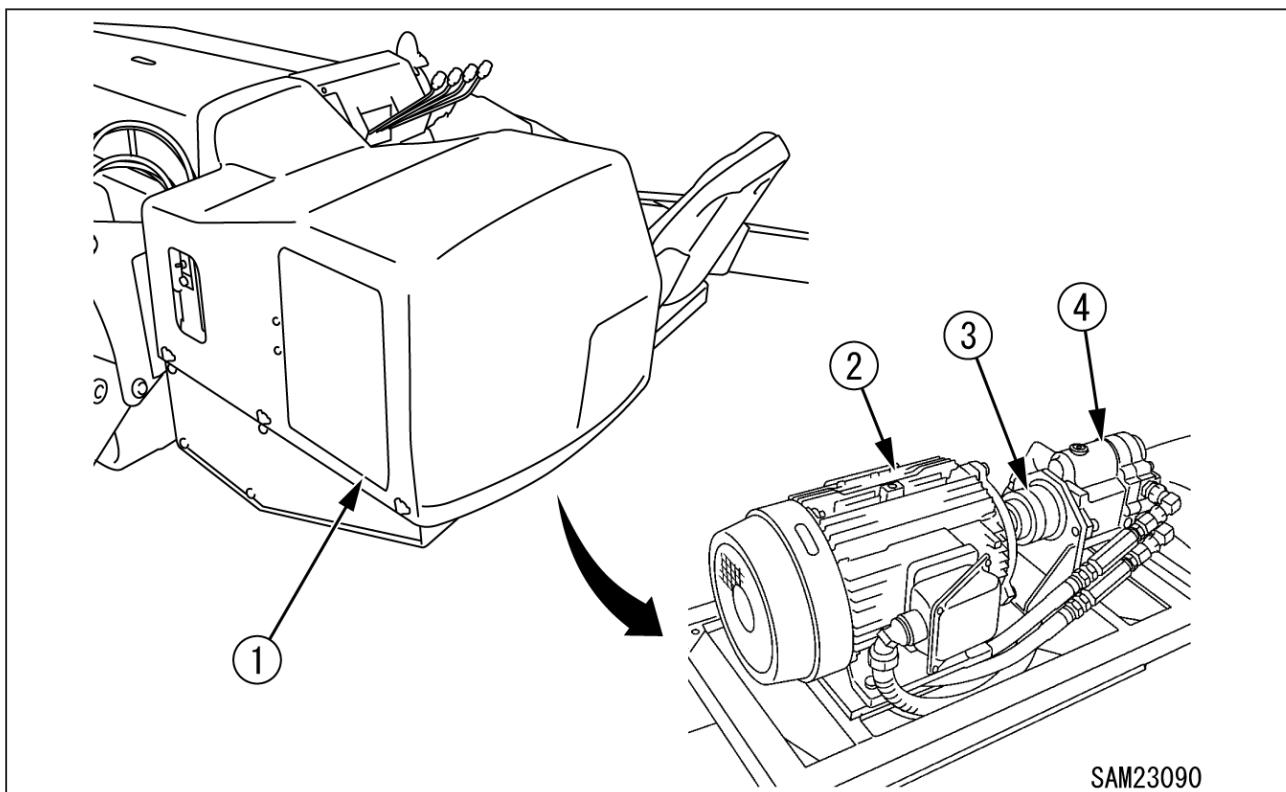
Use the pedal to adjust the electric motor speed or output.

- Low idling : Release your foot from the pedal.
- Full speed : Press down fully on the acceleration pedal.



☞ Press down on the acceleration pedal to the position necessary for the work.

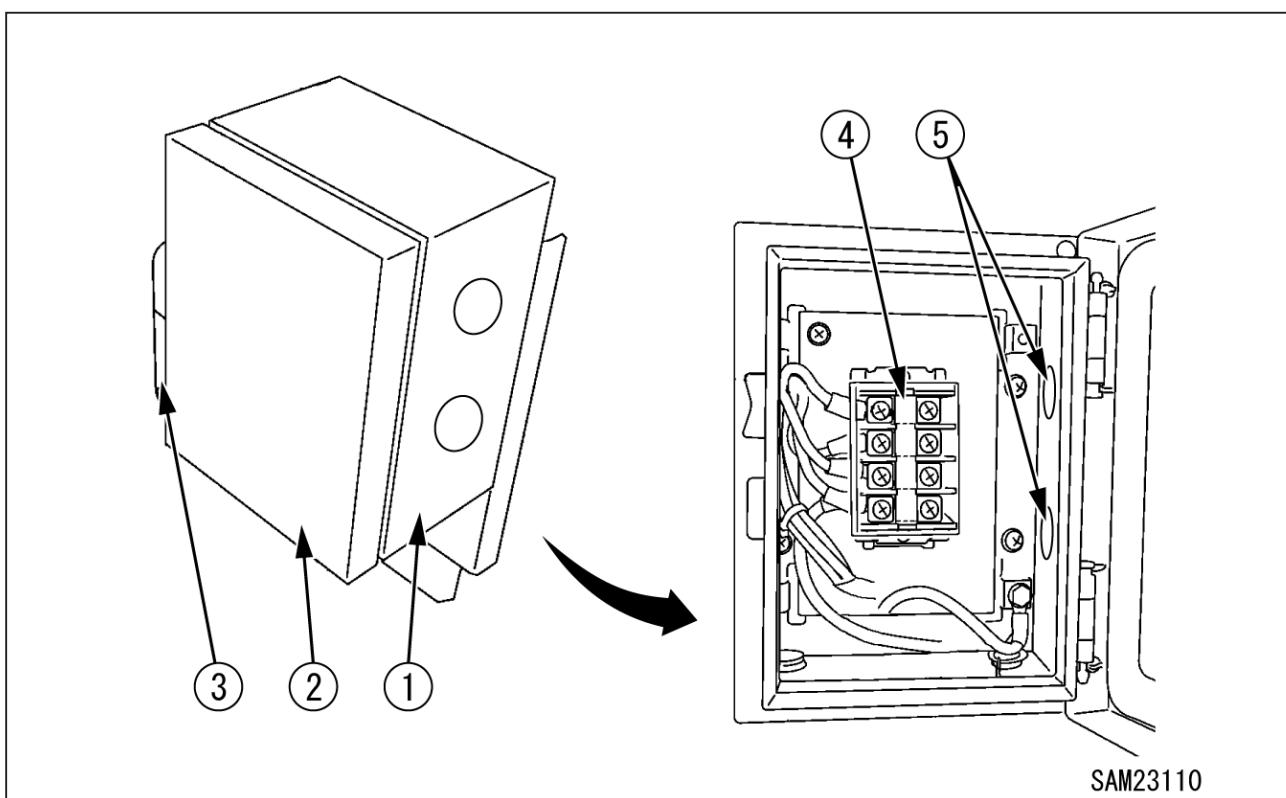
4.3.1.2 POWER UNIT



(1) Rear cover
 (2) Electric motor

(3) Coupling
 (4) Hydraulic pump

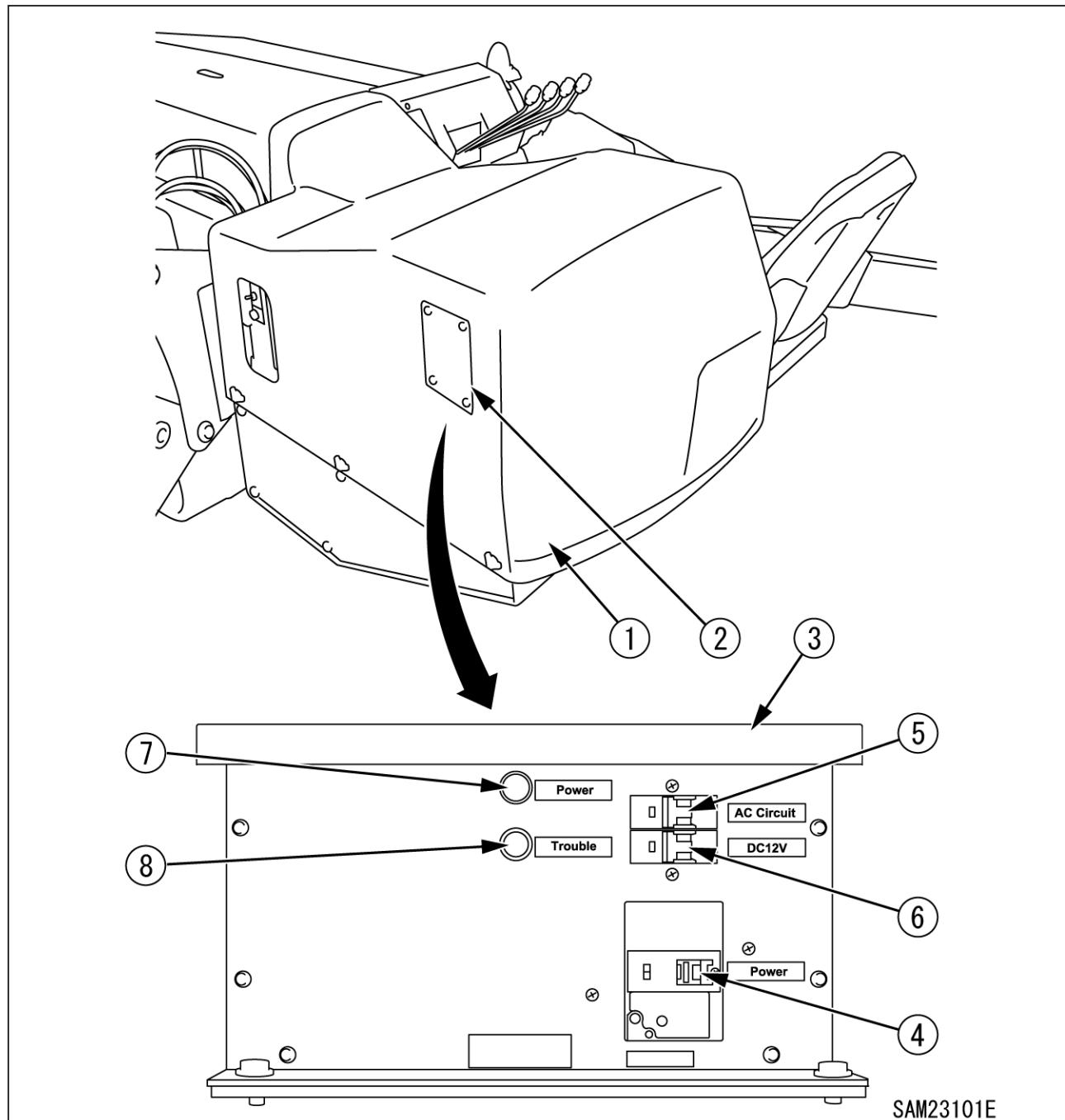
4.3.1.3 POWER SUPPLY BOX



(1) Power supply box
 (2) Power supply box door
 (3) Door handle

(4) Terminal block
 (5) Cable inserting hole

4.3.1.4 INVERTER UNIT



(1) Rear cover	(5) DC12V power switch
(2) Protective cover	(6) AC circuit power switch
(3) Inverter unit	(7) Power lamp (white)
(4) Main breaker (with a leak detector)	(8) Trouble lamp (red)

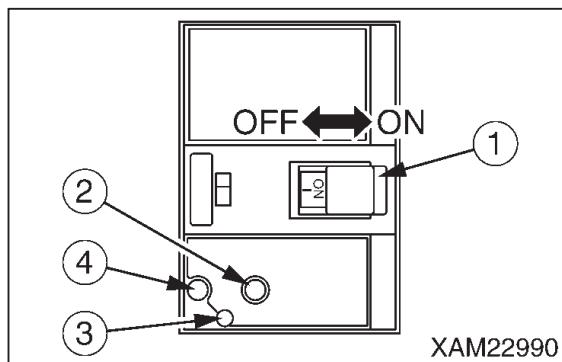
[1] MAIN BREAKER (WITH A LEAK DETECTOR) (4)

⚠ WARNING

- Make sure the breaker is OFF when this machine derives no power from power supply equipment and when work is completed.
- Abnormal conditions are encountered around the Inverter unit, electric motor, or electric wiring when the breaker is automatically turned OFF during operation. Be sure to locate failures and check for burnt smell and parts. Promptly contact us or our sales service agency.
- Inspection and repair must be completed before turning ON the breaker to re-supply power.

Potential fire or machine failure may occur if disregarded.

The main breaker is equipped with the parts shown in the figure.



- (1) Breaker
- (2) Overvoltage/ground-fault indication button (yellow)
- (3) Trip button (red)
- (4) Ground-fault test button (grey)

- The breaker (1) is designed to provide automatic shutoff of the power that is supplied from the Inverter unit to the electric motor in the event of an error including overcorrect and overvoltage, to prevent fire and machine failure.

- The breaker (1) also controls the supply of power to the electric motor and Inverter unit.
 - ON: Power is supplied.
 - OFF: No power is supplied.
- The overvoltage/ground-fault indication button (2) on the cover is designed to eject in the event of an overvoltage or ground fault. For reset, press the breaker to turn the ON.
- The trip button (3) is designed to mechanically trip the breaker as external control.
- The ground-fault test button (4) is used to test tripping in response to a ground fault. Proper tripping is assured if the overvoltage/ground-fault indication button (2) on the cover ejects.

⚠ CAUTION

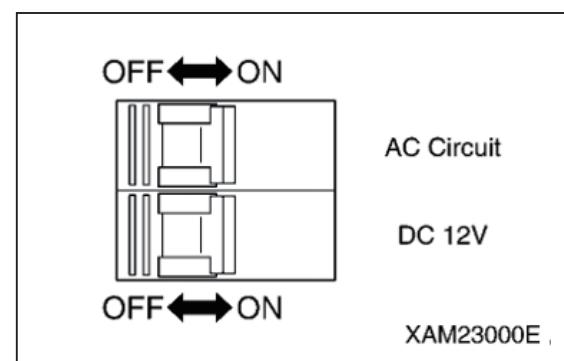
Periodic (biannual) ground fault test is recommended.

The test button should be controlled at 10-second or longer intervals and not be pressed more than required.

If an indication of a ground fault remains on after the overvoltage/ground-fault indication button (2) is reset, contact us or our sales service agency.

[2] DC12V POWER SWITCH (5)

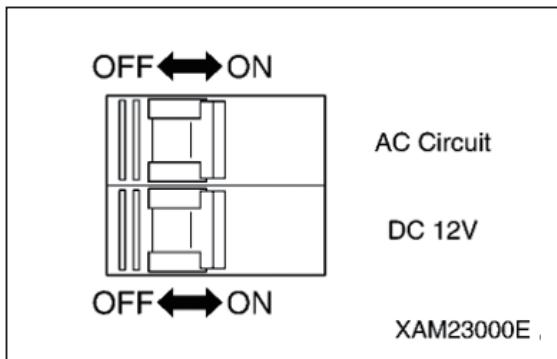
The DC12V power switch is used to switch the DC power output source for the crane operation system.



- ON :Power is supplied to the crane operation system.
- OFF :No power is supplied to the crane operation system.

[3] AC CIRCUIT POWER SWITCH (6)

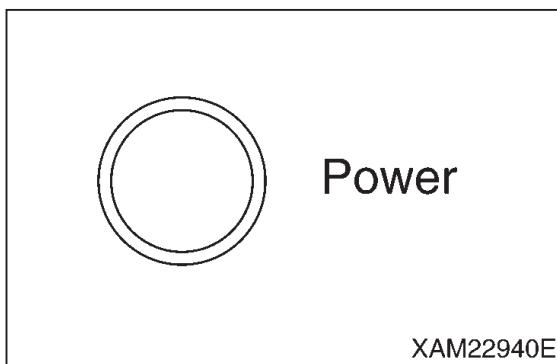
The AC circuit power switch is used to switch the AC power output source for the Inverter unit and inverter cooling fan.



- ON :Power is supplied to the Inverter unit and inverter cooling fan.
- OFF :No power is supplied to the Inverter unit and inverter cooling fan.
- ☞ No safety hazard is posed even if the DC12V power switch and AC circuit power switch remain on.
- ☞ The AC circuit power switch is illustrated in the figure, and the DC12V power switch is illustrated in the lower figure.

[4] POWER LAMP (WHITE) (7)

The power lamp is designed to indicate the presence of energisation to this machine from power supply equipment.



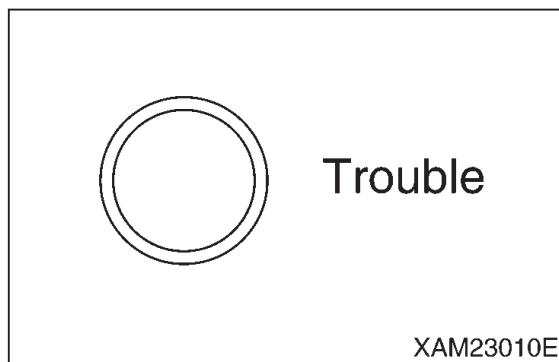
- ON :This machine is deriving power from power supply equipment.
- OFF :This machine is deriving no power from power supply equipment.
- ☞ If the power lamp remains off despite the power supply equipment breaker being turned ON with power supply assured between power supply equipment and this machine, check the power supply on power supply equipment.

[5] TROUBLE LAMP (RED) (8)**⚠ WARNING**

An error occurs in the Inverter unit, which causes the trouble lamp to come ON. Contact us or our sales service agency.

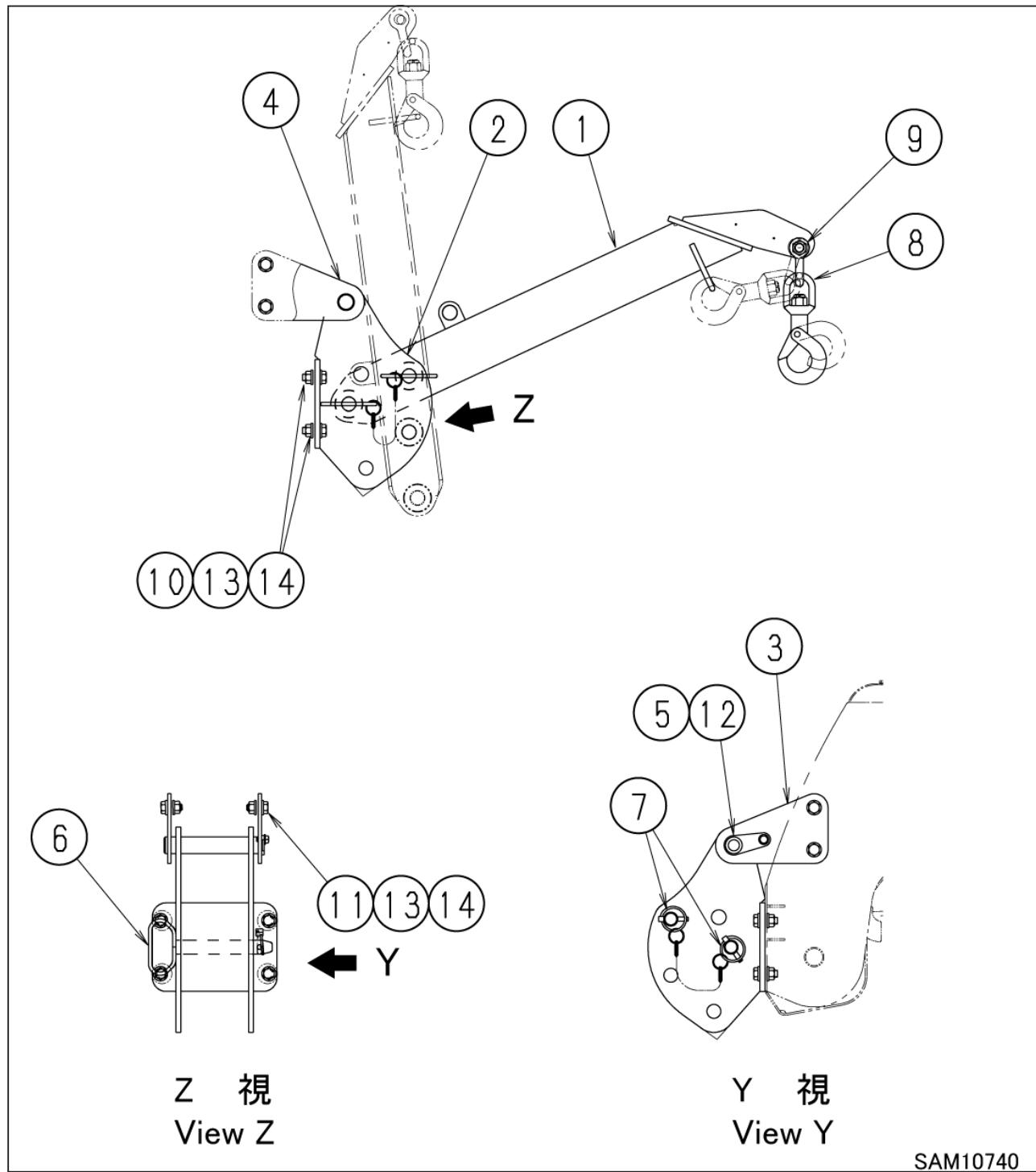
The trouble lamp is designed to indicate the presence of an error in the Inverter unit.

- ON :An error is detected in the Inverter unit.
- OFF :The Inverter unit is in normal operation.



4.4 SEARCHER HOOK COMPONENT

4.4.1 850kg SEARCHER HOOK COMPONENTS(OPTION)

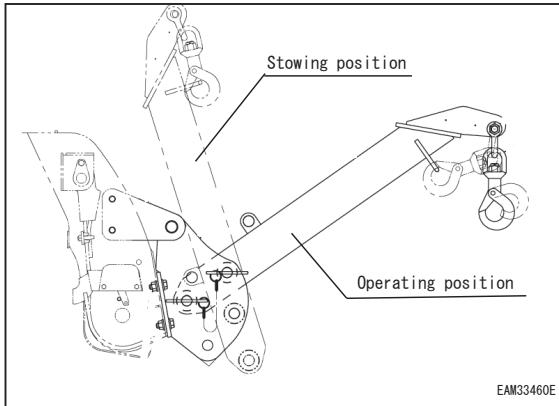


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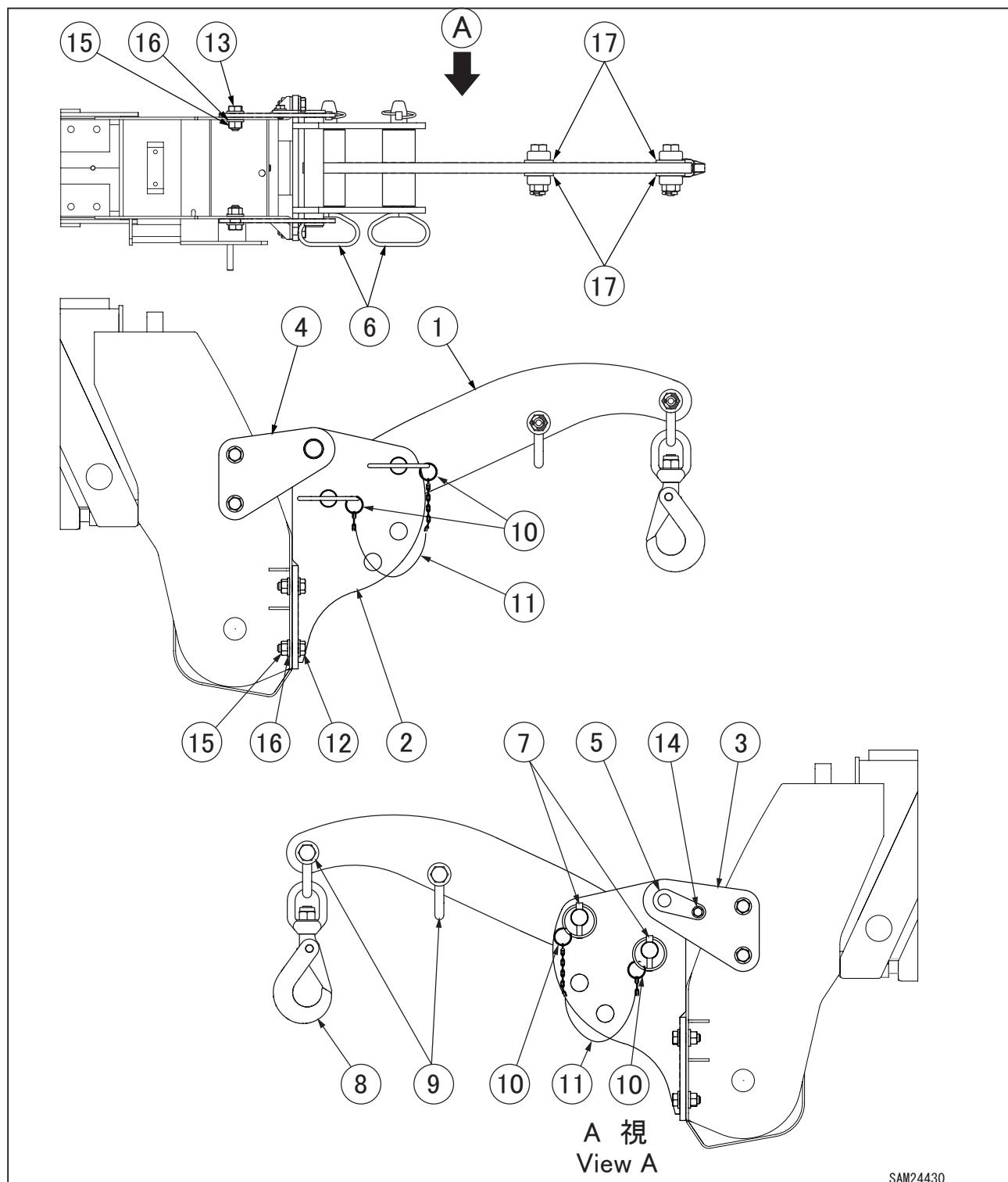
(1) E-Boom	(8) Hook
(2) Bracket	(9) Shackle
(3) Bracket 1	(10) Hexagonal bolt with washer (strength 10.9)
(4) Bracket 2	(11) Hexagonal bolt with washer (strength 10.9)
(5) Pin	(12) Hexagonal bolt with washer (strength 10.9)
(6) Position pin	(13) Nut (strength 10)
(7) Lynch-pin	(14) High tension washer

4.4.1.1 SEARCHER HOOK STOWING POSITION AND OPERATING POSITION

- When not using the searcher hook, please move it to the stowing position.
- If left in the working position for a long period of time, water may accumulate inside.



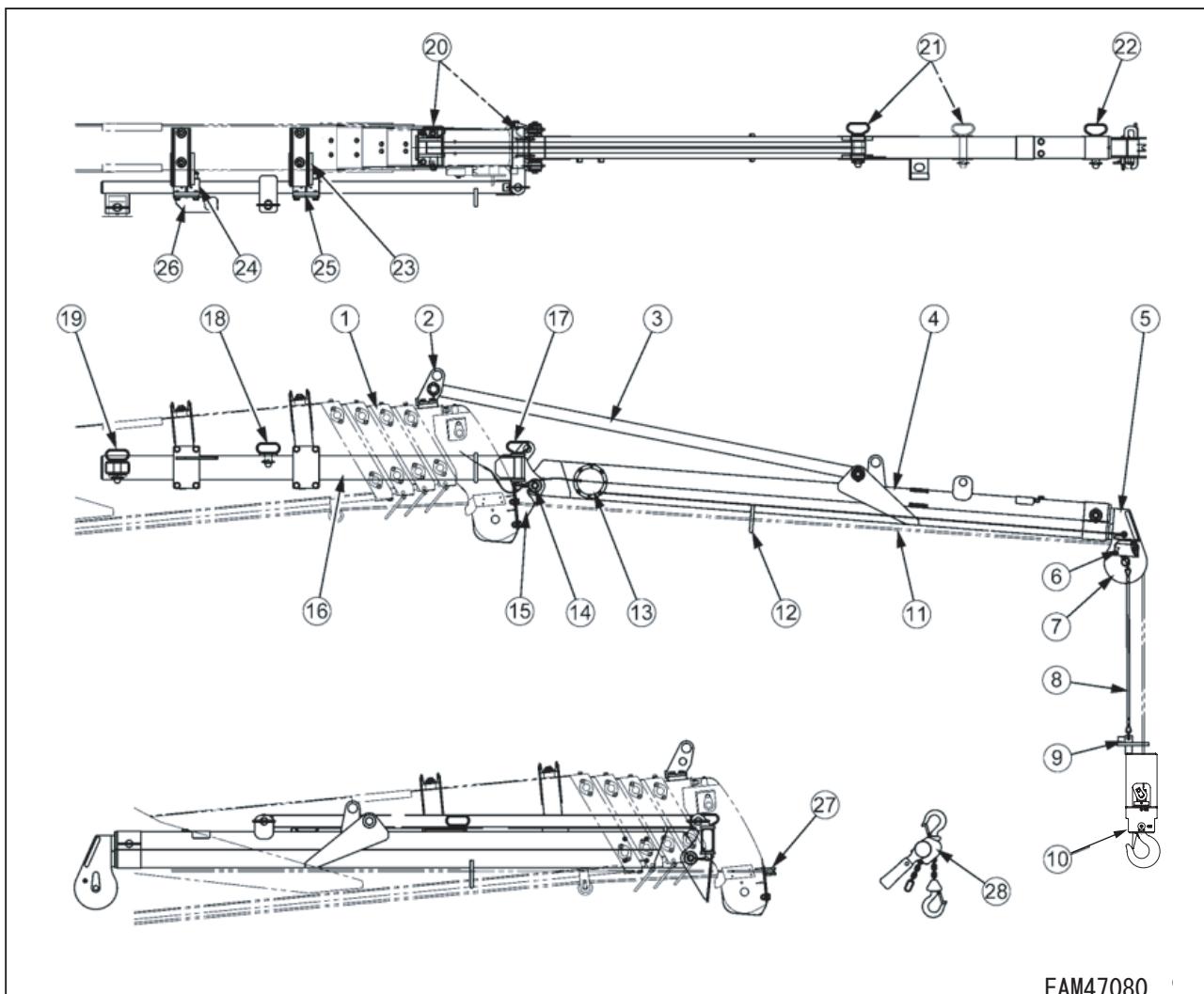
4.4.2 1.5t SEARCHER HOOK COMPONENTS(OPTION)



- (1) Bracket
- (2) Bracket A
- (3) Bracket B
- (4) Fixing pin
- (5) E-boom
- (6) Position pin
- (7) Lynch pin
- (8) Swivel hook

- (9) Shackle
- (10) Hexagonal bolt with washer
- (11) Hexagonal bolt with washer
- (12) Hexagonal bolt with washer
- (13) Hexagonal nut
- (14) High tension washer
- (15) Plain washer

4.5 FLY-JIB COMPONENTS (OPTION)



EAM47080

(1) Main boom	(15) Jib bracket
(2) Rod bracket	(16) Stowing bar
(3) Supporting rod	(17) Position pin 150L
(4) No.1 fly-jib	(18) Position pin 55L
(5) No.2 fly-jib	(19) Position pin 95L
(6) Overwinding detector	(20) Position pin 135L
(7) Sheave	(21) Position pin 135L
(8) Protective rope	(22) Position pin 135L
(9) Protective weight	(23) Bar guide A
(10) Single fall hook block	(24) Bar guide B
(11) Wire rope	(25) Bar guide C
(12) Hook holder	(26) Bar guide D
(13) Cord real	(27) Sheave for fly-jib stowing (Accessory)
(14) Hoot pin	(28) Lever block (Accessory)

4.6 PROTECTION BAR

⚠ WARNING

- Keep the crane boom away from the protection bar/operators control stand area.
- It may be necessary to temporarily remove the protection bar, to reduce machine overall height during travel.
- The protection bar and interlock do not provide full protection for the operator. Operators must check their surroundings and carefully operate the crane so that hoisted loads and the hook block do not hit people or the protection bar.

IMPORTANT

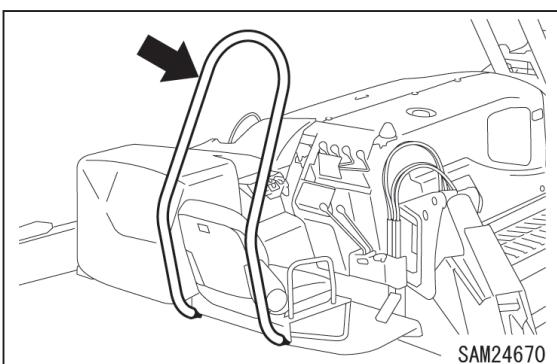
Do not lean on or pull the protection bar.

Doing so may cause it to bend or warp.

It is for protection of the operator from the crane boom during boom deployment/stowage and crane lifting operation.

Item	Abstract
Protection Bar	Weight 27 lb (12 kg)
Bolts	Designated torque : 111±12 Nm (11.3±1.2 kg/m)

☞ The protection bar is not Roll Over Protection (ROP).



Chapter 5

OPERATION

5.1 OPERATION RELATED PRECAUTIONS

5.1.1 BEFORE STARTING ENGINE

ESTABLISH SAFETY OF WORKING SITE

Worksites may contain many different risks of serious personal injury. Check the following points before starting work to ensure that no dangers are present at the worksite:

- Take care when working near thatched roofs, dead leaves, or dry grass, as there is a risk of fire.
- Examine the ground and road surface condition at the worksite to decide on the optimum working method. Do not operate the machine at sites where there is a risk of landslide or rock fall.
- Level all sloped surfaces at the worksite before starting work.
- When working on roadways, ensure the safety of vehicles and pedestrians by assigning marshallers and installing barriers to keep out unauthorized personnel.
- The worksite should be marked with "Keep out" signs to keep out unauthorized personnel.

Failure to keep clear of moving machinery may result in serious personal injury or death if a person is hit or trapped by the machine.

INSPECTION BEFORE STARTING ENGINE

Execute following inspections before the first engine startup of the day.

Omitting these inspections may result in serious bodily accidents.

- Inspect for the fuel/oil leak, accumulation of combustibles around the engine and battery systems, and similar phenomenon.

For more information, see "6.12.1 PRE-OPERATION INSPECTION"

- Inspect the fuel quantity, coolant quantity, hydraulic oil tank quantity, air cleaner blockage, electrical wiring damage, and check operations of safety devices and instruments.

For more information, see "6.12.1 PRE-OPERATION INSPECTION"

- Make sure the operation levers are at neutral position.

Check that the operation linkages operate adequately.

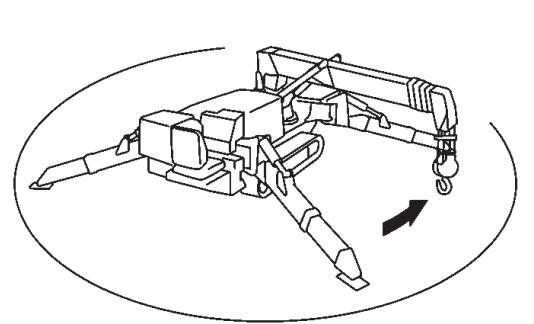
Always repair if any result of the above is faulty.



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CAUTIONS WHEN STARTING ENGINE

- Make sure no person or object is within the boom slewing radius area before starting engine.
- Sound the horn for warning before starting the engine.
- Do not start the engine by short-circuiting the starter circuit. Such may cause a fire.



XAM05500

5.1.2 AFTER STARTING ENGINE

INSPECTION AFTER STARTING ENGINE

Omitting the inspections after starting the engine may result in delays in discovering machine abnormalities as well as personal injury or machine damage. Inspection should be carried out in a clear area. No unauthorized persons should be allowed to approach the machine.

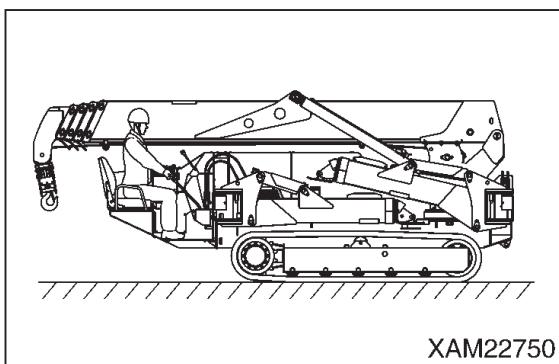
- Inspect the equipment operation conditions, machine travelling conditions, outrigger operation conditions, winch winding up and down, boom derricking, and crane operation conditions such as extension, retraction and slewing.
- Inspect the sound, vibration, heat and odour of the machine, and check for instrument errors, air leaks, oil leaks, fuel leaks, water leaks and other bad factors. Be extra careful with fuel leaks.
- Always repair broken part whenever an abnormality is found.

Attempt to use without servicing may result in unexpected bodily accidents and/or machine failures.

CAUTIONS WHEN STARTING TO MOVE MACHINE

To prevent serious injuries and death accidents, always execute the followings before travelling the machine.

- Set the machine to the travelling posture in the following diagram.



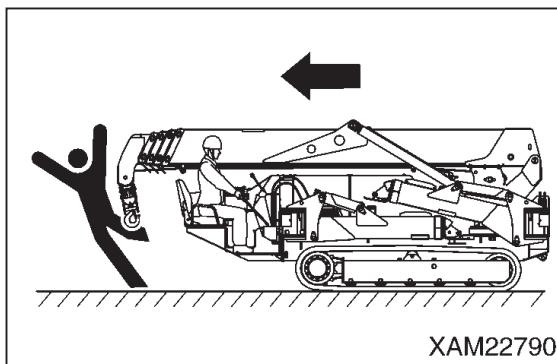
- Do not travel when the hook block is not contained.
 - Make the boom fully lowered and retracted.
 - Fix the hook block to the containment position.
 - Make the outrigger contained.
- For more information, see "5.2.5 TRAVELLING POSTURE."
- Make sure again that no one or object is in the vicinity before starting to move.
- Sound the horn for warning before starting to move.
- Always remain seated in the cab seat during travelling operation of the machine.
- The machine is prohibited to travel when a person or load is on the travelling dolly or the boom.
- When travelling, stow hook and outrigger, and make sure the surrounding safety.
- When stowing outriggers, insert each position pins completely to lock.

CAUTIONS WHEN TRAVELLING FORWARD/BACKWARD OR CHANGING DIRECTION

Always observe followings to prevent serious injuries and deaths when travelling the machine.

- Drop the speed early and wait until the machine stops before changing from forward to backward, or backward to forward.
- Sound the horn and alert to the people nearby before changing between forward/backward movements or changing direction.
- Check that no one is around the machine. The front of the machine frame requires special attention because certain part of vision is blocked, so stop the machine as necessary and make sure no one is at front or around.
- Place a guide if the location is hazardous or with bad view.

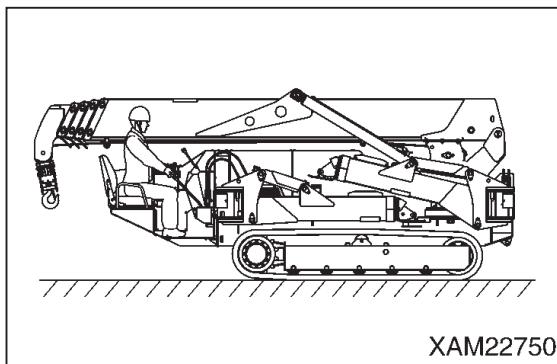
- Make sure to prevent people from crossing the travelling direction or be at the direction to be changed.



CAUTIONS WHEN TRAVELLING

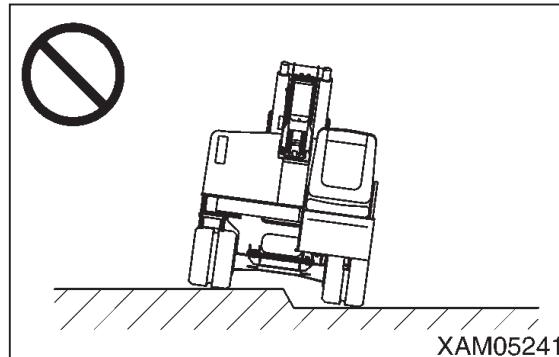
Not observing these cautions in travelling will result in serious accidents.

- When travelling, stow hook and outrigger, and make sure the surrounding safety.
- When stowing outriggers, insert each position pins completely to lock.
- Be seated to operate travelling.

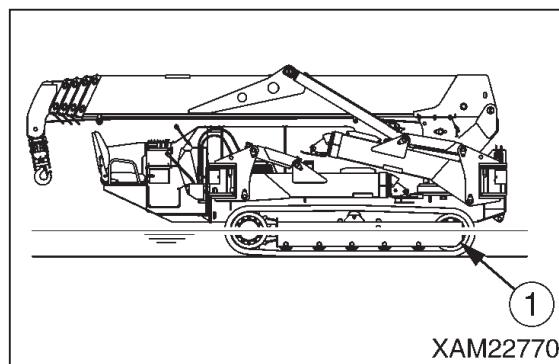


- Travelling over the boulder stones or a stump not only causes the tip-over of the machine, but also gives an impact to the machine (especially around crawlers), causing breakage. Avoid or remove the obstacles not to travel over it whenever possible. If you have to travel over the obstacles by

necessity, be sure to take the "travelling posture" to lower the centre of gravity, and reduce the travelling speed as much as possible so that the machine will go over the obstacles at the centre of the crawlers.



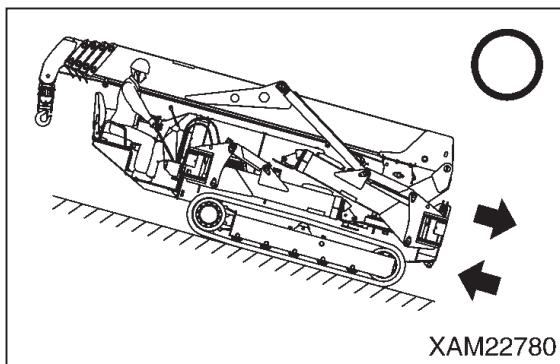
- Use this machine in the water of the depth of under the centre of the idler (1) where the muffler beneath the machine body doesn't go under water.



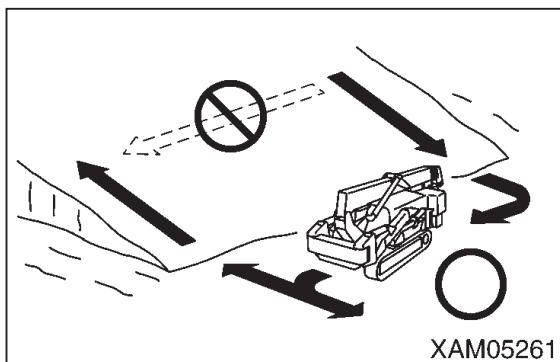
CAUTIONS ON UPWARD/DOWNWARD SLOPE

- If the machine tilts for "15 degrees" or more forward, backward, leftward, or rightward while travelling, the machine may overturn. Do not travel on the slope of more inclination.
- Be sure to switch the travelling high-speed switch to the "OFF" (low speed) position when travelling on the slope. Travelling on the slope in the high-speed travelling mode may result in overshoot on the downward slope.
- If the machine tilts for "15 degrees" or more forward, backward, leftward, or rightward while travelling, the machine may overturn. Do not travel on the slope of more inclination.
- Be sure to switch the travelling high-speed switch to the "OFF" (low speed) position when travelling on the slope.

- Travelling on the slope in the high-speed travelling mode may result in overshoot on the downward slope.



- The slopes inclined for 15 degrees or more presents tip-over hazard. Do not travel on these slopes.
- Be sure to switch the travelling high-speed switch to the "OFF" (low speed) position when travelling on the slope. The machine may overshoot.
- Never change the direction on the slope or cut the slope horizontally. Travel safely such as by going down to the level ground and taking a detour.



- Operate the acceleration pedal and travelling levers to decrease the travelling speed as much as possible when going down the slope. Operating the travelling lever to the "Neutral" position automatically breaks the machine, but may overshoot when going down the slope at high speed

CAUTION WHEN TRAVELLING ON UNSTABLE GROUND

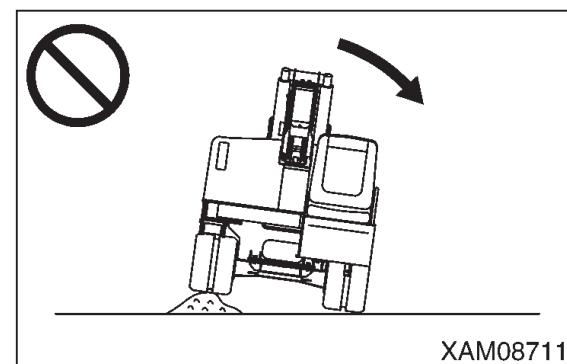
Always observe the following points to prevent serious injuries or fatal accidents when travelling over unstable ground for unavoidable reasons:

- Do not travel into areas with soft ground. Otherwise, the machine may become stuck.
- Where possible, avoid travelling close to unstable ground near cliffs, road shoulders, and deep trenches.

There is a risk of the machine toppling or falling if the ground gives way due to the weight or vibration of the machine. Particular caution is necessary after rain, use of explosives, or earthquakes, as the ground will be unstable.

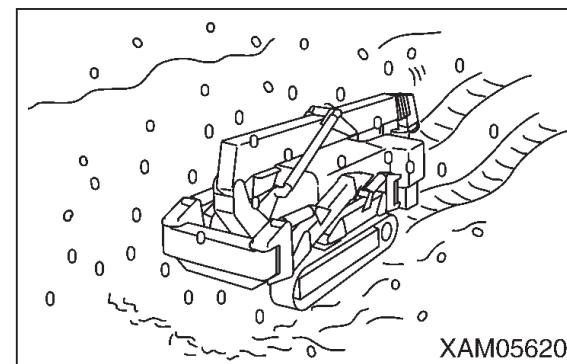
- Where possible, avoid travelling close to unstable ground on embankments or excavated trenches.

There is a risk of the machine tilting if the ground gives way due to the weight or vibration of the machine.

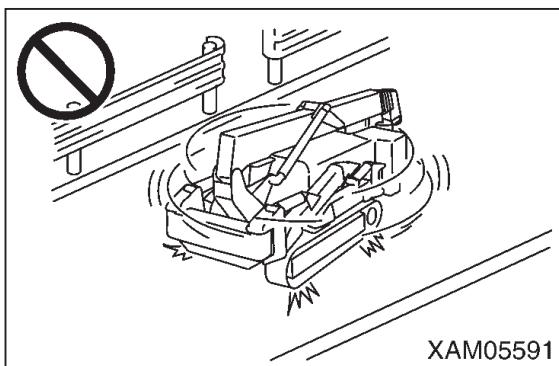


CAUTIONS WHEN SNOW COVERED OR FROZEN

Always observe the following points to prevent serious injuries or fatal accidents when travelling over snow-covered ground or frozen roads for unavoidable reasons:



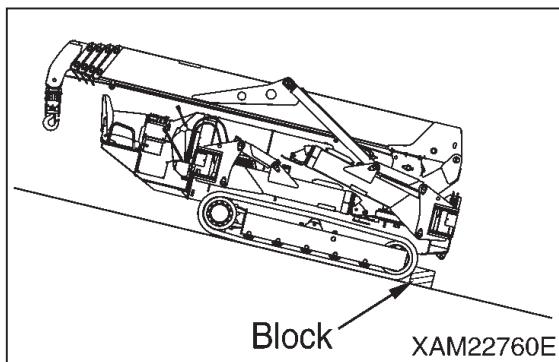
- Travel as slowly as possible and avoid sudden starts, stops, or turns when travelling on snow or frozen surfaces. There is a risk of slipping even on slight inclines. Travelling up and down slopes is especially dangerous due to the risk of slipping.
- Take care on frozen ground, as it tends to soften as the temperature rises, causing a risk of the machine toppling or becoming stuck.
- There is a risk of the machine toppling or becoming buried if driven into deep snow. Be careful when travelling away from road shoulders or into snow drifts.
- Take care when travelling on snow, as there is a danger of toppling and collision if road shoulders or other structures are hidden by snow.
- Do not directly touch metal surfaces with your hands or fingers in cold conditions. Touching metal surfaces of the machine in freezing conditions may result in skin freezing to the metal surface.
- Remove snow or ice build-up on the machine, as this may make the safety nameplates hard to read. Snow or ice on the boom in particular should be completely removed, as there is a risk of it falling off and hurting someone.



CAUTION WHEN PARKING

- When parking, select a location with flat and solid ground.
- When parking, select a location without a risk of landslide, rock fall, or flooding.

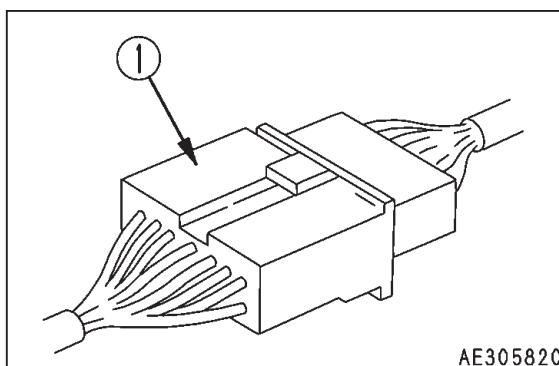
- Choose a level and solid location to park the machine. If it is necessary to park on a slope, chock the machine to prevent it from moving.



- Careless contact with the travelling lever(s) during the engine operation may result in sudden movement of the machine, leading to serious accidents.
- Always set the travelling lock lever to the "LOCK" position when parking the machine.
- Stop the engine and always remove the key for the starter switch. Bring the key with you when you leave the machine.

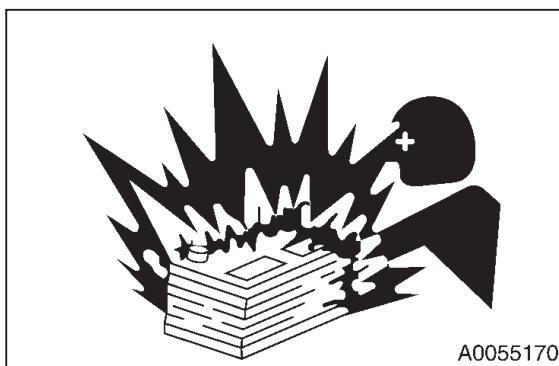
CAUTIONS UNDER COLD WEATHER

- After work is complete, wipe off any condensation, snow or mud on wire harnesses, connector (1), switches, sensors or other similar parts, and cover them. If condensation seeps inside and freezes, the machine may not operate properly when it is next used, resulting in unexpected accidents.



- Remove snow from and defrost the surfaces of the slewing gear, boom and around the winch, and check that they operate correctly before starting work.

- Before starting the engine, ensure that the pre-heating lamp goes off. Operating the machine without sufficiently warming up the engine may cause the machine to respond slowly to control lever and pedal operations, possibly resulting in unexpected movement. Be sure to warm up the engine. The engine needs adequate warmup time, especially in cold conditions.
- Avoid acutely accelerating the engine during short time after starting the engine.
- Increase the oil temperature of the hydraulic circuit by relieving the oil pressure (let the pneumatic oil to escape to the hydraulic oil tank by raising to above the hydraulic circuit set pressure) by using operation lever. Doing so improves the Machine reactions and prevents improper operations.
- When the battery fluid is frozen, do not recharge the battery or start the engine using another power source. Otherwise, there is a risk of explosion. Defrost the battery fluid and check for fluid leakage before recharging or starting the engine using another power supply.



5.2 OPERATION

5.2.1 CHECKING BEFORE OPERATION

Perform the steps described in this section before starting work each day.

5.2.1.1 VISIBLE CHECKS

For more information on inspection, see “6.12.1.1 PRE-START VISIBLE CHECKS.”

5.2.1.2 CHECKING BEFORE STARTING ENGINE

For more information on inspection, see “6.12.1.2 PRE-START INSPECTION - BEFORE STARTING ENGINE.”

5.2.1.3 CHECKING AFTER STARTING ENGINE

For more information on inspection, see “6.12.1.3 POST-START INSPECTION - AFTER STARTING ENGINE.”

5.2.2 STARTING ENGINE

⚠ WARNING

Verify that there is no one and obstacle around when starting the engine. Honk a horn and start the engine.

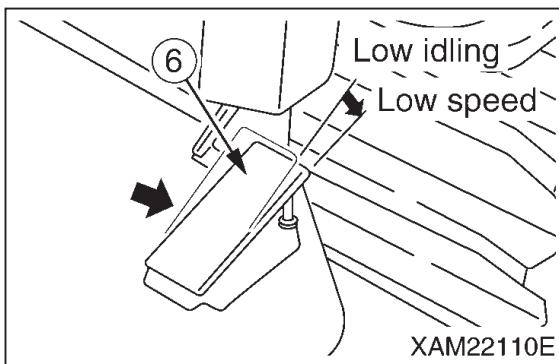
5.2.2.1 NORMAL ENGINE START

⚠ CAUTION

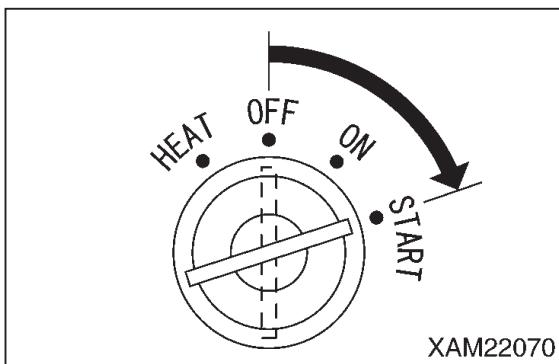
- If it is hard to start the engine due to low ambient temperature, see “5.2.2.2 STARTING ENGINE IN COLD WEATHER” for the engine starting operation.
- Do not keep the starter turned for more than 5 seconds. Doing so will accelerate the battery discharge. Wait for about 1 minute before attempting to start the engine again if it did not start.

- Verify that the fuel lever of the water separator pot is at the vertical position (open) before starting the engine.
- Verify that the main switch on the receiver is at the “OFF” position.

1. Lightly step on the acceleration pedal (6) to operate the engine at low speed.

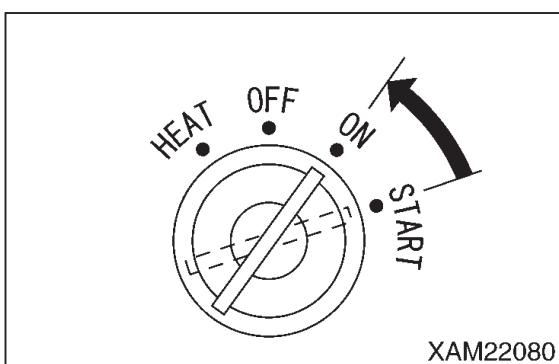


2. Insert the key into the starter switch and turn the key to the “START” position.



3. Release your hand from the key once the engine has started.

The key will automatically return to the “ON” position.



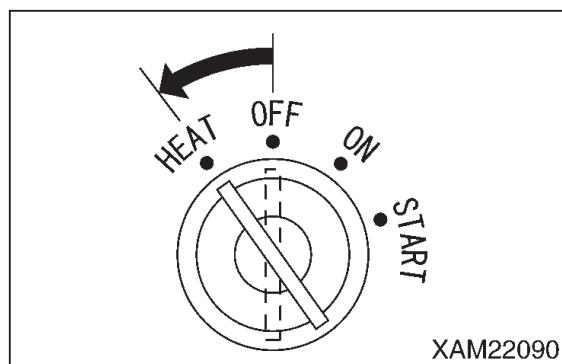
5.2.2.2 STARTING ENGINE IN COLD WEATHER

⚠ CAUTION

- Do not keep the starter turned for more than 5 seconds. Doing so will accelerate the battery discharge. Wait for about 1 minute before attempting to start the engine again if it did not start.
- Verify that the fuel lever of the water separator pot is at the vertical position (open) before starting the engine.
- Verify that the main switch on the Receiver is at the “OFF” position.

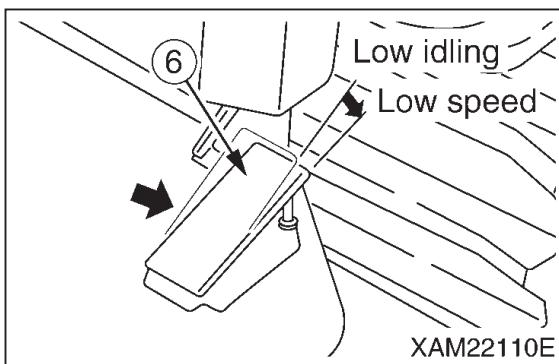
Start the engine as follows when it is cold.

1. Insert the key into the starter switch and turn the key to “HEAT” (preheat) position. Keep the position until the “preheat monitor” goes off. Release your hand, and the key will automatically return to the “ON” position.

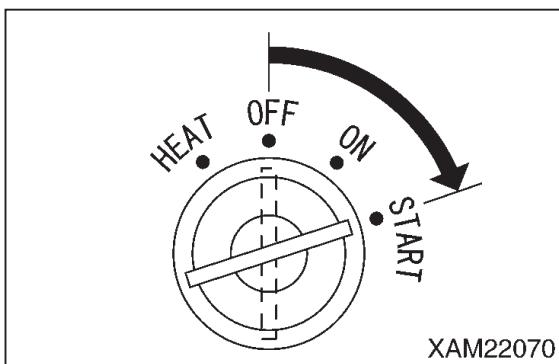


☞ When the starter switch is operated to the “HEAT” (preheat) position, the “preheat monitor” lights up, indicating that the engine is preheated. When the engine preheating has completed, the “preheat monitor” goes off.

2. Step on the acceleration pedal (6) to the half of the full stroke and operate the engine at medium speed.

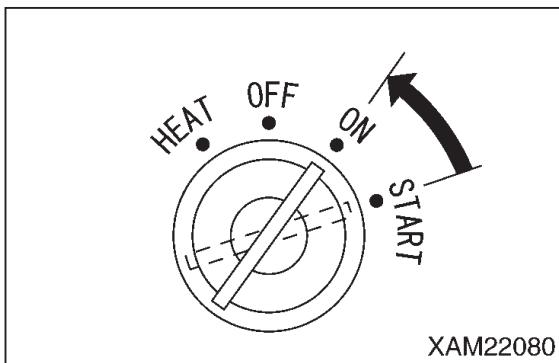


3. When the "preheat monitor" goes off, turn the key to the "START" position.



4. Release your hand from the key once the engine has started.

The key will automatically return to the "ON" position.



5.2.3 OPERATIONS AND CHECKS AFTER STARTING ENGINE

⚠ DANGER

Never refuel (diesel oil) while the engine is in operation.

Always stop the engine when refuelling.

⚠ WARNING

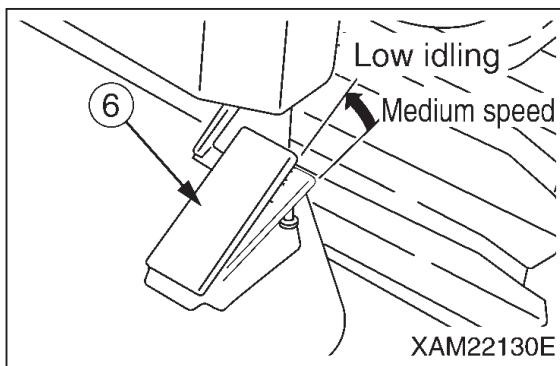
- If any abnormal condition takes place during the warm-up operation, immediately press the engine emergency stop switch (EMO) to stop the engine for emergency. Then, turn the starter switch to the "OFF" position. The power to the electrical system will be shut off.
- Always perform the warm-up operation. The sufficient warm-up operation is necessary particularly when it is cold. Insufficient warm-up operation will slow down the movement response of the travelling system or crane system to the operation levers, resulting in serious accidents.
- Always check the operation of the crane after warm-up operation. Be careful not to let the hook block interfere or collide with the boom.
- Be careful not to let the boom hit the operator or this machine when slewing the boom.
- If you find any abnormality during the crane operation check, stop the machine immediately for emergency and repair. Using the system in abnormal condition can result in serious accidents.

⚠ CAUTION

- The appropriate temperature of the hydraulic oil is 50 to 80 °C. Even when operating at low temperature by necessity, increase the temperature of the hydraulic oil to about 20 °C.
- Do not idle away suddenly until the warm-up operation is done.
- When the engine has started, check if the “battery charge monitor” and “engine oil pressure monitor” went off. If there is any abnormality, repair.
- Do not leave the engine in low idling or high idling for more than 20 minutes. If idling is necessary, apply load from time to time or operate at the medium engine speed.
- When using the engine at low speed, idle away the engine for about 5 minutes once a day

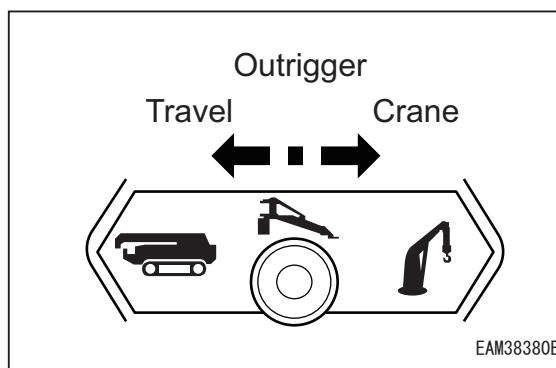
Perform the warm-up operation as follows once the engine has started.

1. Leave your foot away from the acceleration pedal (6). Keep the engine idling and continue the operation with no load for about 5 minutes.

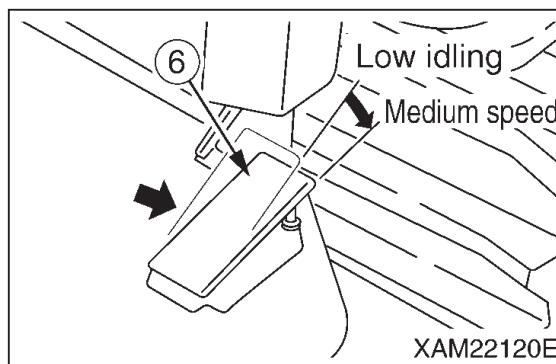


2. Check if there is any abnormality with the engine exhaust gas colour, noise, and vibration. If there is any abnormality, repair.

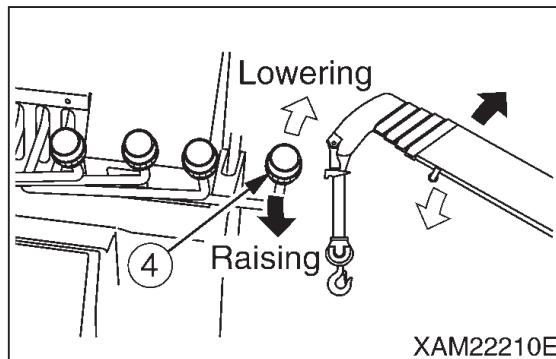
3. Operate the work selector switch (travel/outrigger/crane) to the “Outrigger” position.



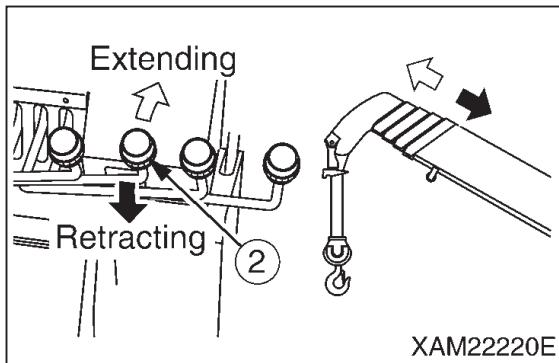
4. See “5.2.13 OUTRIGGER SETTING” and set the outriggers.
5. See “5.2.16 BEFORE CRANE OPERATIONS” to loosen the hook block from the stowing position.
6. Step on the acceleration pedal (6) to the half of the full stroke and operate the engine at medium speed.



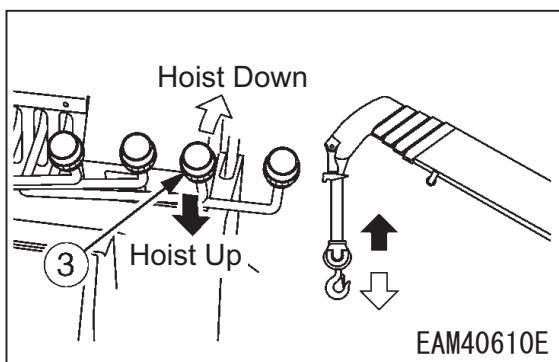
7. Operate the boom derrick lever (4) slowly forward / backward and move the derrick cylinder up/down until it reaches the stroke end. Check if there is any abnormality with the operation. If there is any abnormality, repair.



8. Operate the boom telescoping lever (2) slowly forward / backward to extend/retract the boom until it reaches the stroke end. Check if there is any abnormality with the operation. If there is any abnormality, repair.

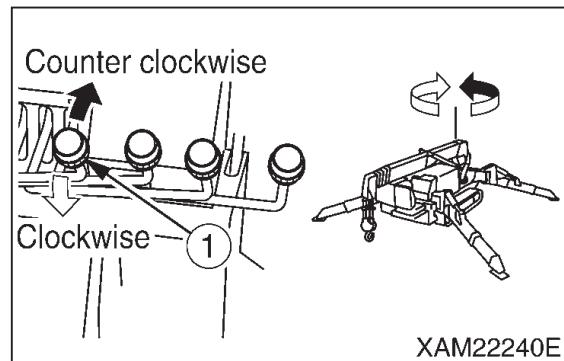


9. Operate the winch lever (3) slowly forward/backward to check if the hook block is smoothly hoisted up/down. Also check if the hook block immediately stops and the winch drum does not wind in mess when the winch lever returns to the "Neutral" position. If there is any abnormality, repair.



10. Operate the winch lever (3) slowly forward/backward to check if the hook block is smoothly hoisted up/down. Also check if the hook block immediately stops and the winch drum does not wind in mess when the winch lever returns to the "Neutral" position.

If there is any abnormality, repair.



5.2.4 RUNNING-IN OPERATION

⚠ WARNING

Perform running-in for the period of about the first 250 hours (hours displayed on the service meter).

The life of the machine shortens if overloaded operation or task is performed before the various sections of the machine are used to the operation.

While this machine is shipped after thorough adjustment and inspection, forcing the machine from the beginning will quickly degrade the functions of engine and crane, shortening their life.

Perform the running-in for the first "250 hours" (time displayed on the service meter).

Pay attentions particularly to the followings during the running-in period.

- Be sure to perform the warm-up operation and avoid idling away after the engine has started.

For more information, see

"5.2.3 OPERATIONS AND CHECKS AFTER STARTING ENGINE."

- Avoid overloaded operation or tasks with high-speed operation.

- Avoid sudden starting, sudden acceleration, unnecessary sudden stop or sudden steering
- When the running-in period reaches “50 hours”, do not fail to change the engine oil. For more information, see “6.18.8”[1] REPLACEMENT ENGINE OIL AND OIL FILTER.”

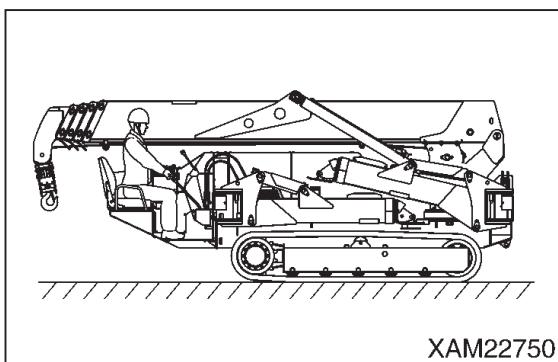
The metal powder produced inside the engine through running-in increases in the engine oil and it deteriorates the oil, shortening the engine life.

5.2.5 TRAVELLING POSTURE

⚠ WARNING

- When travelling this machine self-propelled, take the “travelling posture” with which the boom, hook block, and outriggers are stowed.
- Travelling with the boom extended or Pick & Carry with the boom extended is essentially prohibited. This will overturn the machine, causing serious injury accidents.
If you have to perform Pick & Carry by necessity, see “5.2.26 PICK & CARRY OPERATION” and strictly observe the methods described and cautions given.
- Do not use this machine for other purpose than the major purpose such as using it for carrying the load on the machine.
- Follow the local laws and regulations if travelling the machine on public roads.

Take the travelling posture shown in the figure when travelling the machine.



1. See ““5.2.23 CRANE STOWING OPERATION” to stow the crane. Stow the hook block in the specified position.
2. See “5.2.24 OUTRIGGER STOWING OPERATION” to stow the outriggers.

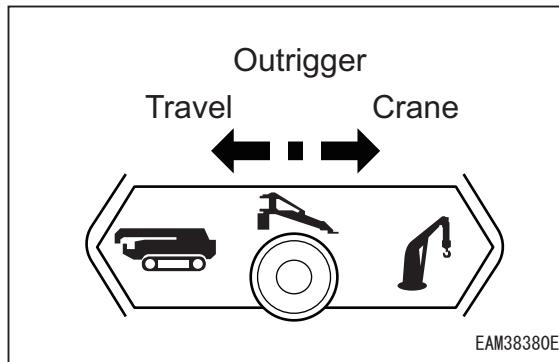
5.2.6 TRAVELLING MACHINE

⚠ WARNING

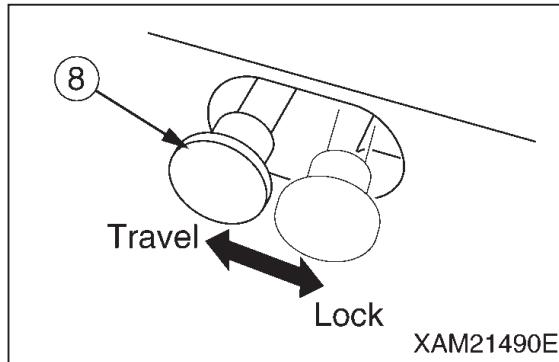
- Do not allow anyone to come around the machine.
- Put away all the obstacles on the travelling path.
Check for projections and grooves on the travelling path especially when going backward.
Fix the travelling path.
- Check the safety around the machine and honk a horn before starting travelling the machine.
- Adjust the engine speed to low and operate the left and right travelling levers slowly at the same time. Check the travelling speed of the machine.
Do not make sudden start especially when you are going backward. You can cause serious accidents.
- The front of the machine will be the blind corner. Be extremely careful when travelling forward.
- If you cannot verify the safety because the travelling direction is the blind corner, stop travelling and check the safety in the travelling direction. Staff a guide person if necessary depending on the worksite situation.
- Operate the work selector switch (travel/outrigger/crane) to the “Travel” position and the travelling lock lever to the “Travel” position.

[PREPARATION BEFORE STARTING TRAVELLING]

1. Operate the work selector switch (travel/outrigger/crane) on the outrigger operation panel to the "Travel" position.



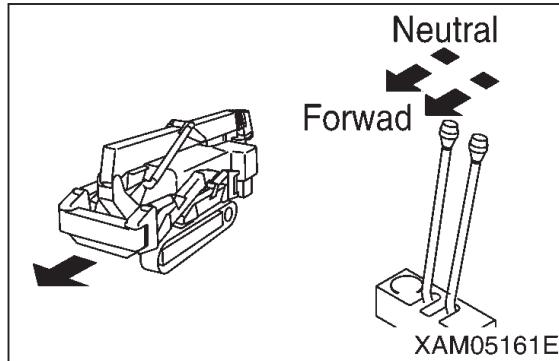
2. Push down the travelling lock levers (8) to the "TRAVEL" position.



[1] TRAVELLING FORWARD

Operate the left and right travelling levers at the same time.

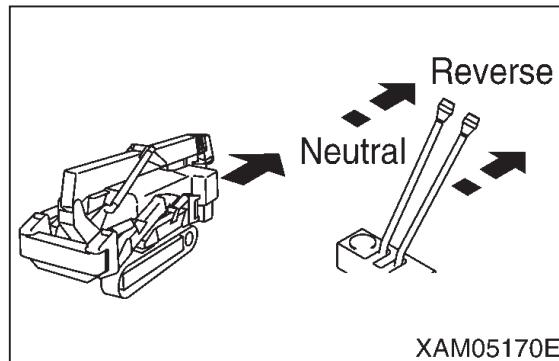
- Push the left and right travelling levers slowly forward to move forward.



[2] TRAVELLING BACKWARD

Operate the left and right travelling levers at the same time.

- Pull the left and right travelling levers slowly toward you to move backward.



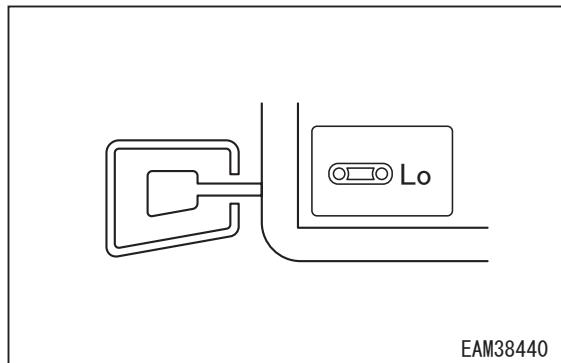
5.2.7 CHANGING MACHINE TRAVELLING SPEED

! WARNING

- Choose the appropriate travelling speed to the ground and road surface conditions while travelling the machine. You can operate the travelling levers or choose "high-speed travelling mode" or "low-speed travelling mode" with the operation position of the travelling high-speed switch to change the travelling speed.
- Always set the travelling high-speed switch to the "OFF" (low speed) when travelling on the slope. Travelling on the slope in the high-speed travelling mode may cause overshoot on the downward slope.
- Be sure to stop the machine before changing the travelling speed mode.

[1] CHANGING TRAVELLING SPEED MODE

Operate the travelling high-speed switch on the monitor to change the machine travelling speed.

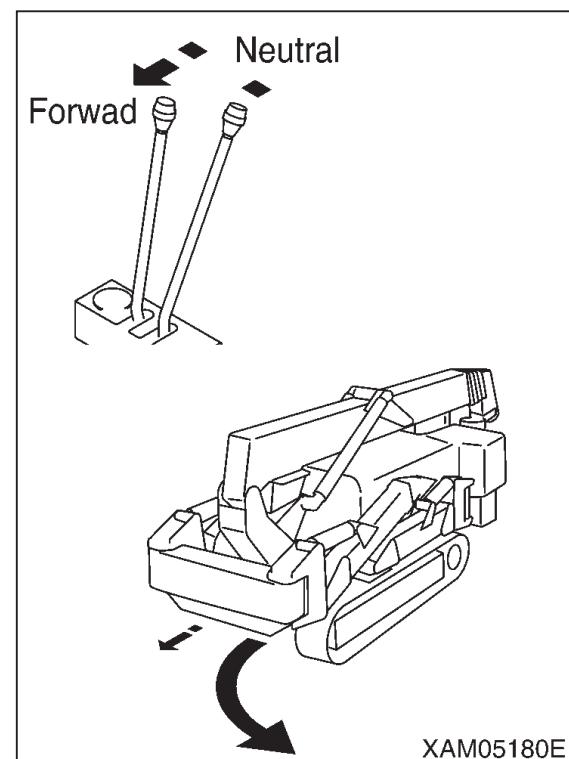


5.2.8 DIRECTIONAL CONTROLS

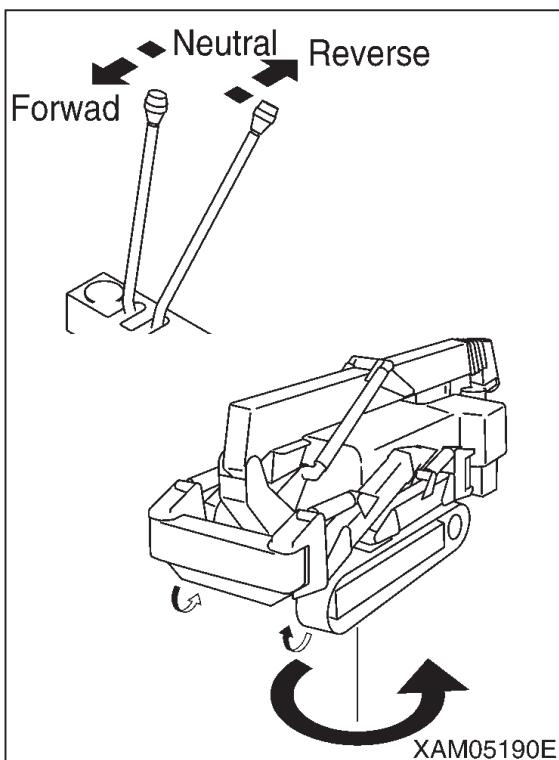
⚠ WARNING

- **Sudden steering or unnecessary spin turns at high speed not only damages the rubber track and hydraulic devices, but also may result in collision with other objects.**
Stop the machine, then adjust the engine speed to low speed before performing the spin turns.
- **Do not change the path on the slope. The machine may slip to the side. Be especially careful on the soft ground and clay soil.**

[1] CHANGING THE MACHINE DIRECTION WHILE BEING STOPPED



- **Left Turn**
Operate the right travelling lever.
Tilt the travelling lever forward to turn to the left in the forward direction.
Tilt the travelling lever toward you to turn to the left in the backward direction.
- **Right Turn**
Operate the left travelling lever.
Tilt the left travelling lever forward to turn to the right in the forward direction.
Tilt the left travelling lever toward you to turn to the right in the backward direction.

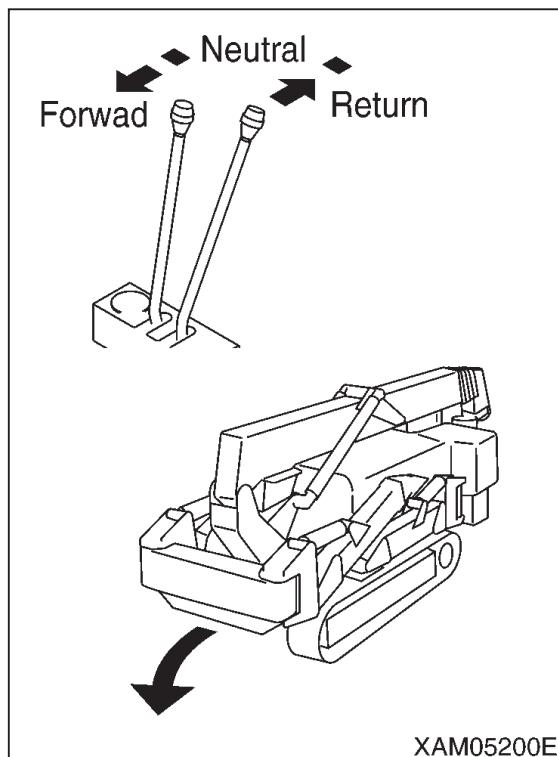
[2] SPIN TURNS

- **Left Spin Turn**

Tilt the right travelling lever forward while tilting the left travelling lever toward you to rotate the left and right rubber tracks in the opposite direction for left spin turn.

- **Right Spin Turn**

Tilt the left travelling lever forward while tilting the right travelling lever toward you to rotate the left and right rubber tracks in the opposite direction for right spin turn.

[3] CHANGING PATH WHILE TRAVELLING FORWARD/BACKWARD

- **Left Turn While Travelling Forward**

While tilting the right travelling lever forward, return only the left travelling lever to the "Neutral" position.

- **Left Turn While Travelling Backward**

While tilting the right travelling lever toward you, return only the left travelling lever to the "Neutral" position.

- **Right Turn While Travelling Forward**

While tilting the left travelling lever forward, return only the right travelling lever to the "Neutral" position.

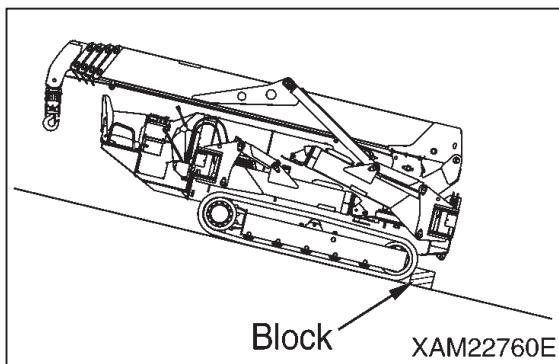
- **Right Turn While Travelling Backward**

While tilting the left travelling lever toward you, return only the right travelling lever to the "Neutral" position.

5.2.9 STOPPING/PARKING MACHINE

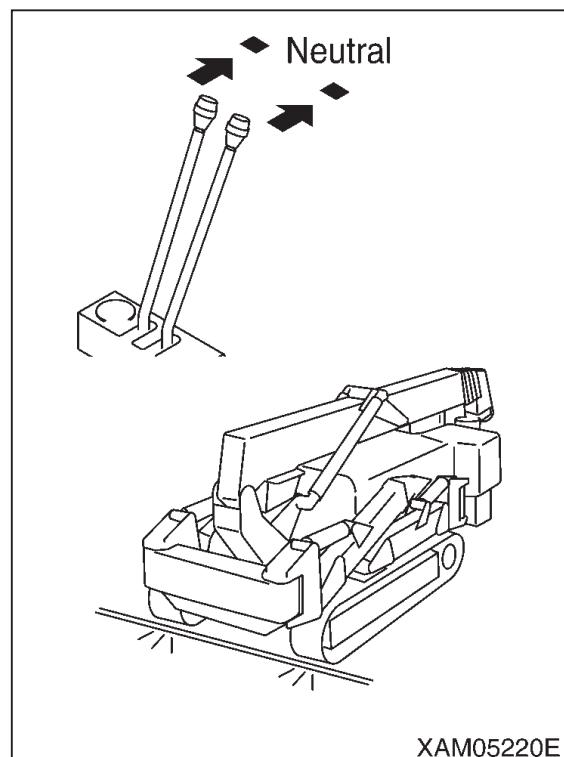
⚠ WARNING

- Avoid sudden stop and try to stop with margin whenever possible.
- Choose levelled and solid location for parking the machine.
- If you park on the slope by necessity, provide some break so that the machine will not move.

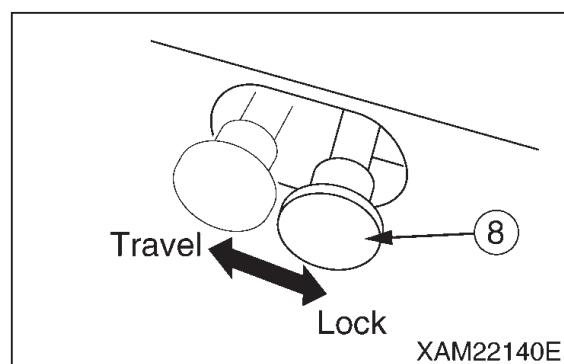


- Careless contact with the travelling lever(s) during the engine operation may result in sudden movement of the machine, leading to serious accidents.
- Always set the travelling lock lever to the "LOCK" position when parking the machine.
- Stop the engine and always remove the key for the starter switch. Bring the key with you when you leave the machine.

1. Operate the left and right travelling levers to the "Neutral" position at the same time. This automatically brakes the machine and the machine stops.



2. Knock down the travelling lock lever (8) to the "LOCK" position.

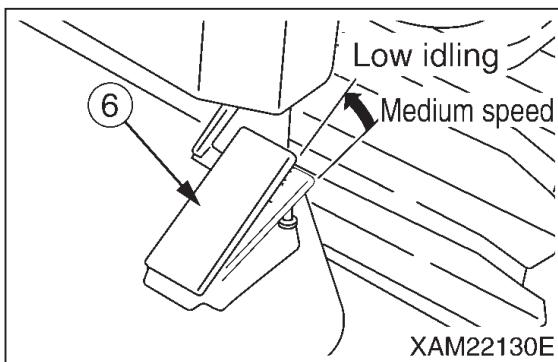


5.2.10 STOPPING ENGINE

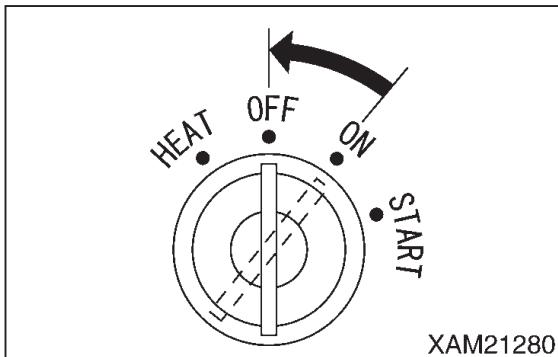
⚠ CAUTION

- Stopping the engine before it sufficiently cools down may shorten the life of engine units. Do not stop the engine suddenly except for emergency.
- When the engine is overheated, do not stop the engine suddenly. Change the engine speed to low speed, and gradually cool down the engine before stopping the engine.
- Verify that the main switch at the control box unit of remote control system is at the “OFF” position.

1. Release your foot from the acceleration pedal (6) and change the engine speed to idling. Continue the no-load operation for about 5 minutes.



2. Turn the starter switch key to the “OFF” position.
The engine will stop.



3. Remove the starter switch key.

5.2.11 INSPECTION AFTER STOPPING ENGINE

1. Visibly check for oil leakage, fuel leakage, and water leakage, and check around the crawlers, crane, and exterior of the machine. If you find any leakage or abnormality, fix the problem.
2. Top off the fuel tank.
3. Dead leaves and papers around the engine will cause fire. Remove the dead leaves and papers.
4. Clean off mud on the crawlers and outriggers.

5.2.12 DESCRIPTION ON OUTRIGGER AND CRANE SAFETY DEVICES

⚠ WARNING

Understand well the operation sequence below, warning display from the safety devices under the corresponding machine conditions, and the details of operation stop. Keep these in mind for safe operations.

The table below shows what kind of “display and warning” will be issued and the resulting action of the safety devices when this machine is used in the standard condition.

The standard operation sequence shown here is as follows.

[1]Check before setting outriggers ⇒ [2]Outrigger setting operation ⇒ [3]Crane operation ⇒ [4]Crane stowing operation ⇒ [5]Outrigger stowing operation ⇒ [6]Machine travelling operation

The columns of the table below are described below.

Standard Operation Sequence, Machine Status	Display and Warning	Activation of Safety Devices
This field shows the standard operation sequence and the operation position of operation levers and switches, and machine status.	This field shows the “display” and “warning” issued as a result of the operation.	This field shows the name of the safety device that prevents the resulted error and its action.

[1] CHECK BEFORE SETTING OUTRIGGERS

Standard Operation Sequence, Machine Status	Display and Warning	Activation of Safety Devices
<ul style="list-style-type: none"> Start the engine Travelling lock lever at “LOCK” position 		
Check if the machine is in the posture of stowing the boom <ul style="list-style-type: none"> Fully retract the boom Boom horizontal stowing position Boom slewing stowing position 	<ul style="list-style-type: none"> Boom stowage lamp (red) on the outrigger status display screen ON [Working status lamp (red) flashes] 	Outrigger interlock device <ul style="list-style-type: none"> All the outrigger operations stop if the boom stowage lamp does not light up.

[2] OUTRIGGER SETTING OPERATION

Standard Operation Sequence, Machine Status	Display and Warning	Activation of Safety Devices
<p>Set the outriggers.</p> <p>1.Extend the outriggers.</p> <ul style="list-style-type: none"> • Rotate the outrigger rotary and secure them at the specified position with the position pin • Work selector switch (travel/outrigger/crane) "Outrigger" • Outrigger switches "OUT"(Outrigger extension mode) 	<ul style="list-style-type: none"> • Extension lamp (green) on the outrigger status display screen ON [Working status lamp (red) flashes] 	<p>Outrigger interlock device</p> <ul style="list-style-type: none"> • All the outrigger operations stop if one of the four extension lamps does not light up.
<p>2.Set the outriggers.</p> <ul style="list-style-type: none"> • Outrigger grounding switch "OUT" • Check the level with the level. 	<ul style="list-style-type: none"> • Ground set-up lamps (green) on the outrigger status display screen [Working status lamp (red) OFF] 	
When the machine tilts for 3 degrees or more during outrigger setting operation	<ul style="list-style-type: none"> • Warning alarm buzzer sounds continuously 	Crane inclination alarm device is activated

[3] CRANE OPERATIONS

Standard Operation Sequence, Machine Status	Display and Warning	Activation of Safety Devices
Perform crane operations. • Work selector switch (travel/outrigger/crane) "Crane" • Crane operation with levers	<ul style="list-style-type: none"> Boom stowage lamp on the outrigger status display screen OFF Actual work and the rated total load are compared, and the working status lamp lights up according to the load factor. Load factor for lighting up working status lamp Load factor less than 90%: Working status lamp (green) flashes Load factor 90 to less than 100%: Working status lamp (yellow) flashes, alarm sounds. Load factor 100% or more: Working status lamp (red) flashes, alarm sounds continuously. 	<p>Moment limiter</p> <ul style="list-style-type: none"> When the load factor reaches 100% or more (overloaded), hook hoisting up, boom extending, boom lowering, and boom slewing (depending on operating conditions) operation stop.
When one of the outriggers rise out of the ground during crane operation	<ul style="list-style-type: none"> Ground set-up lamps (red) on the monitor flash [Working status lamp (red) flashes] 	
When two or more adjacent outriggers rise out of the ground during crane operation	<ul style="list-style-type: none"> Ground set-up lamps (red) on the monitor flash [Working status lamp (red) flashes] Alarm buzzer sounds continuously The overwinding display lamp (red) light up 	<p>Crane interlock</p> <ul style="list-style-type: none"> If the extension lamps and ground set-up lamps (total of eight) of two or more adjacent outriggers rise out of the ground, the following operations will stop: Hoisting up, boom extension, boom derricking and boom slewing.
When the hook was hoisted up excessively	<ul style="list-style-type: none"> Alarm buzzer sounds continuously The overwinding indication lamp (red) light up The over un-winding display lamp (red) light up 	<p>Overwinding detector is activated.</p> <p>Hook hoisting up operation stops.</p> <p>Boom extending operation stop</p>

Standard Operation Sequence, Machine Status	Display and Warning	Activation of Safety Devices
When the hook was hoisted down excessively	<ul style="list-style-type: none"> Alarm buzzer sounds continuously 	Winch over un-winding detector is activated. Hook hoisting down operation stops.
When the machine tilts for 3 degrees or more during crane operation	<ul style="list-style-type: none"> Alarm buzzer sounds continuously 	Crane inclination alarm device is activated

[4] CRANE STOWING OPERATION

Standard Operation Sequence, Machine Status	Display and Warning	Activation of Safety Devices
Operate the machine to take the boom stowing posture. <ul style="list-style-type: none"> Fully retract the boom Boom horizontal stowing position Boom slew and stow position 	<ul style="list-style-type: none"> Boom stowage lamp on the monitor ON 	Outrigger interlock device <ul style="list-style-type: none"> If the boom stowage lamp (green) does not light up, all the outrigger operations stop.

[5] OUTRIGGER STOWING OPERATION

Standard Operation Sequence, Machine Status	Display and Warning	Activation of Safety Devices
Stow the outriggers. 1. Stow the outriggers (Ground). <ul style="list-style-type: none"> Work selector switch (travel/outrigger/crane) "Outrigger" Outrigger grounding switch "ON" (Outrigger grounding mode) 	<ul style="list-style-type: none"> Ground set-up lamps (red) on the monitor flash [Working status lamp (red) flashes] 	Crane interlock device <ul style="list-style-type: none"> If any of the extension lamps and ground set-up lamps (total of four) goes off, all the crane operations stop.
2. Stow the outriggers (Retract). <ul style="list-style-type: none"> Outrigger extension switch "ON" Rotate (Stow) the outrigger rotary and secure at the specified position with position pin. Stop the engine. 	<ul style="list-style-type: none"> Extension lamps (red) on the monitor flash [Working status lamp (red) flashes] 	
When the machine tilts for 3 degrees or more during outrigger stowing operation	<ul style="list-style-type: none"> Warning alarm buzzer sounds continuously 	Crane inclination alarm device is activated

[6] TRAVELLING OPERATIONS

Standard Operation Sequence, Machine Status	Display and Warning	Activation of Safety Devices
Travel the machine. <ul style="list-style-type: none"> • Travelling lock lever at “Travel” position • Start the engine. • Operate the travelling levers. 		
When the machine tilts for 15 degrees or more during travelling operation	• Warning alarm buzzer sounds continuously	Crane inclination alarm device is activated

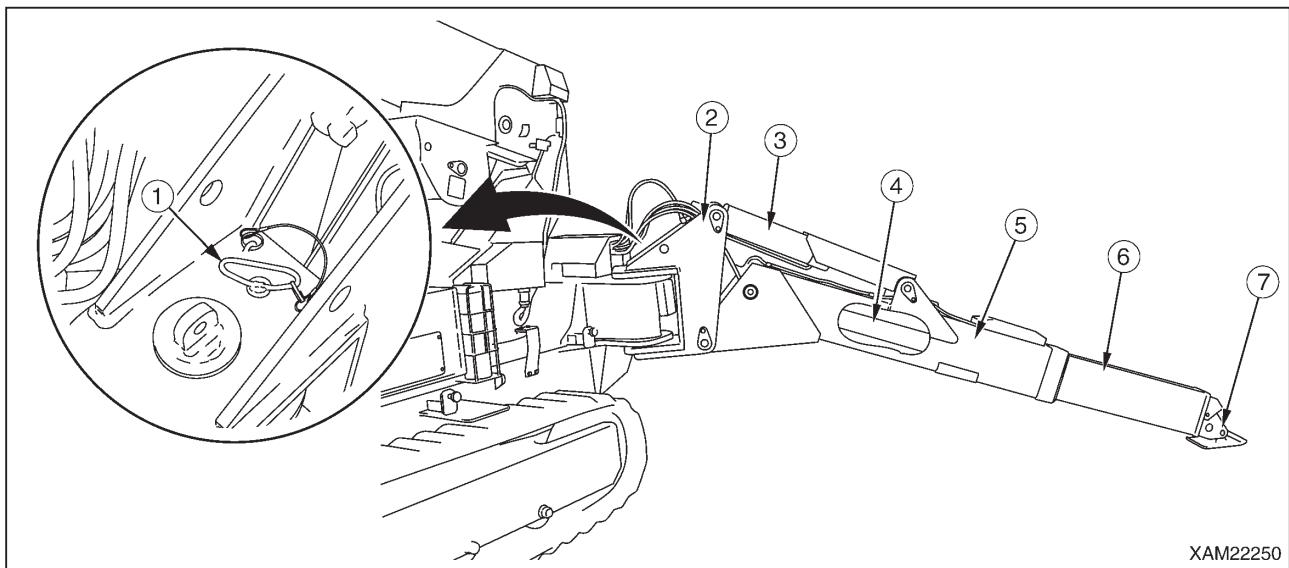
5.2.13 OUTRIGGER SETTING**⚠ WARNING**

For more information on precautions when setting up outriggers, thoroughly check the items related to the outriggers in “5.2.15 WORKING WITH CRANE.”

⚠ CAUTION

- Always keep the boom at the “fully retracted, lowest position and slew and store position” when operating the outriggers. The outriggers cannot be operated if the boom is not stowed completely. (Verify that the boom stowage lamp (green) on the outrigger display is ON.)
- After extending the outriggers, verify that the outriggers are securely set. If all the outriggers are not securely set, the crane operations will not be enabled. (Verify that all of the extension lamps and ground set-up lamps (green) of the outrigger display are lit.)

5.2.14 OUTRIGGER COMPONENTS



(1) Position pin	(5) Outer box
(2) Rotary	(6) Inner box
(3) Outrigger grounding cylinder	(7) Outrigger adapter (Outrigger foot)
(4) Outrigger extension cylinder	

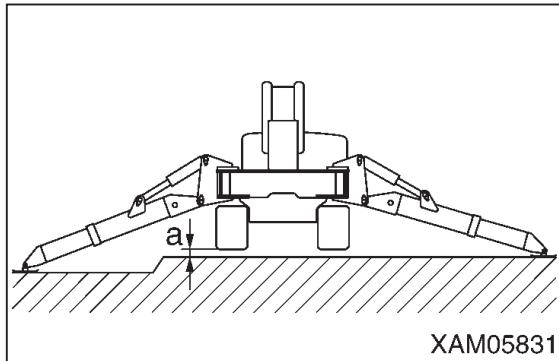
5.2.14.1 CRANE WORKING AREAS DEPENDING ON OUTRIGGER SETTING CONDITIONS

[1] OUTRIGGER MAXIMUM EXTENSION

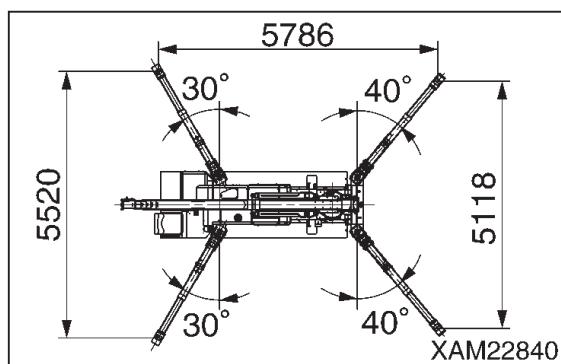
⚠ WARNING

- Make sure all the outriggers are placed properly before performing crane operation. This machine features a safety-interlock system that prevents crane operation unless all the lamps, other than the boom stowage lamp on the outrigger monitor, are on.
- Always place the machine in a horizontal position with the use of the level when extending the outriggers. A warning alarm buzzer sounds when the machine is inclined 3° or more and stops when the machine is placed in a horizontal position.
- When the crane is used with the outriggers extended other than at the maximum, crane operation should proceed with respect to the values specified in the rated total load chart corresponding to "When the crane is used with the outriggers extended at the minimum/medium." Failure to perform crane operation with proper values may cause the machine to tip-over. Exercise caution when performing operation.
- Despite the maximum extension of all the outriggers, the width of extended outriggers decreases due to an ungraded ground even when clearance "a" in the figure is 50 mm. Crane operation should proceed with respect to the values specified in "When the crane is used with the outriggers extended at the medium" in the rated total load chart.

- The machine becomes unsteady at some point if it undergoes a 360-degree slewing with an object hoisted. Irrespective of the rated total load, ensure operation in a short working radius and at low speed.

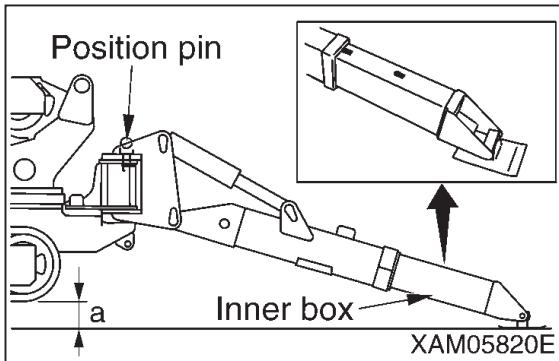


The figure represents the condition "When the crane is used with the outriggers extended at the maximum" in the rated total load chart.



Ensure that all the lamps, other than the boom stowage lamp on the outrigger monitor, are on. If the inner box is retracted even if only slightly, crane operation should proceed with respect to the values specified in the rated total load chart corresponding to "When the crane is used with the outriggers extended at the minimum/medium."

For more information on proper setting of the outriggers, see “5.2.13 OUTRIGGER SETTING.”



- ☞ Outrigger maximum extension is defined as that:
 1. The outrigger is set at the positioning pin position (40° front, 30° back).
 2. The inner box of all the outriggers is extended fully.
 3. All the outriggers are placed on a level surface.
 4. Approx. 50mm is assured for clearance “a” (between the outrigger bottom and crawler bottom) in the figure.

[2] OUTRIGGER MEDIUM EXTENSION

⚠ WARNING

- Make sure all the outriggers are placed properly before performing crane operation.

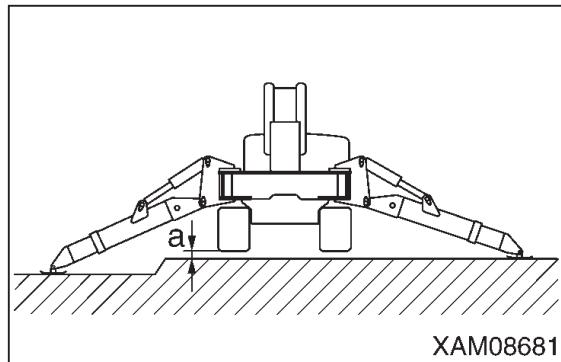
This machine features a safety-interlock system that prevents crane operation unless all the lamps, other than the boom stowage lamp on the outrigger monitor, are on.

- Always place the machine in a horizontal position with the use of the level when extending the outriggers. A warning alarm buzzer sounds when the machine is inclined 3° or more and stops when the machine is placed in a horizontal position.
- When the crane is used with the outriggers extended other than at the maximum, crane operation should proceed with respect to the values specified in the rated total load chart

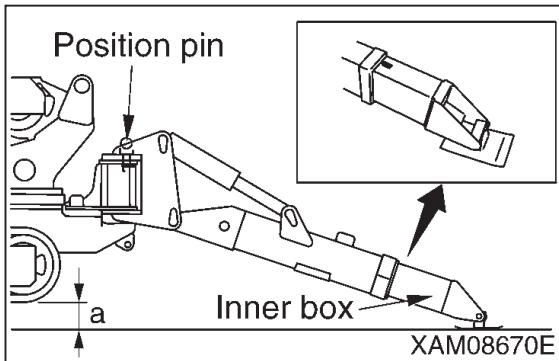
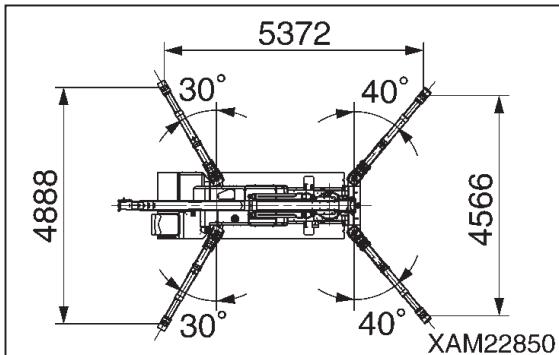
corresponding to “When the crane is used with the outriggers extended at the minimum/medium.”

Failure to perform crane operation with proper values may cause the machine to tip-over. Exercise caution when performing operation.

- Despite the medium extension of all the outriggers, the width of extended outriggers decreases due to an ungraded ground even when clearance “a” in the figure is 50 mm. Crane operation should proceed with respect to the values specified in “When the crane is used with the outriggers extended at the minimum” in the rated total load chart.
- The machine becomes unsteady at some point if it undergoes a 360-degree slewing with an object hoisted. Irrespective of the rated total load, ensure operation in a short working radius and at low speed.



The figure shown represents the condition "When the crane is used with the outriggers extended at the medium" in the rated total load chart.



- ☞ Outrigger medium extension is defined as that:
 1. The outrigger is set at the positioning pin position (40° front, 30° back).
 2. The inner box of all the outriggers is extended at the medium.
 3. All the outriggers are placed on a level surface.
 4. Approx. 50mm is assured for clearance "a" (between the outrigger bottom and crawler bottom) in the figure.
- ☞ If even a group of outriggers is retracted to a medium point, all the outriggers are deemed to be extended at the medium.

[3] OUTRIGGER MINIMUM EXTENSION

⚠ WARNING

- Make sure all the outriggers are placed properly before performing crane operation.

This machine features a safety-interlock system that prevents crane operation unless all the lamps, other than the boom stowage lamp on the outrigger monitor, are on.

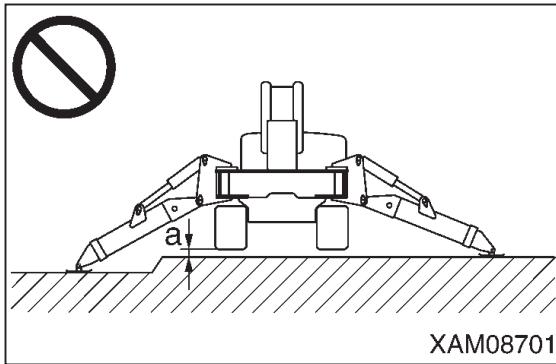
- Always place the machine in a horizontal position with the use of the level when extending the outriggers. A warning alarm buzzer sounds when the machine is inclined 3° or more and stops when the machine is placed in a horizontal position.
- When the crane is used with the outriggers extended other than at the maximum, crane operation should proceed with respect to the values specified in the rated total load chart corresponding to "When the crane is used with the outriggers extended at the minimum/medium."

Failure to perform crane operation with proper values may cause the machine to tip-over. Exercise caution when performing operation.

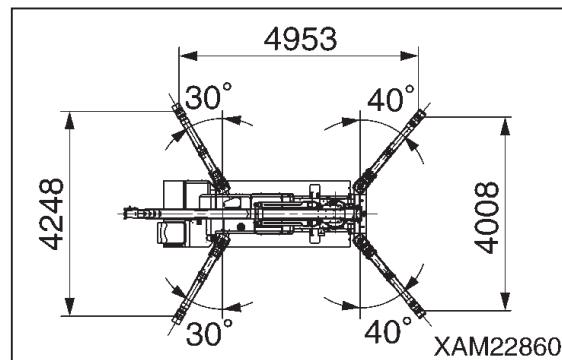
- Crane operation with the outriggers extended at the minimum is permitted only if the outriggers are placed on a level surface. 50mm of dimension between the outrigger bottom and crawler bottom should be obtained.
- On ungraded ground or similar, the width of extended outriggers decreases even when clearance "a" in the figure is 50 mm. Do not perform crane operation under such extension condition.

Potential tip-over of the machine may occur that leads to serious personal injury if disregarded.

- The machine becomes unsteady at some point if it undergoes a 360-degree slewing with an object hoisted. Irrespective of the rated total load, ensure operation in a short working radius and at low speed.

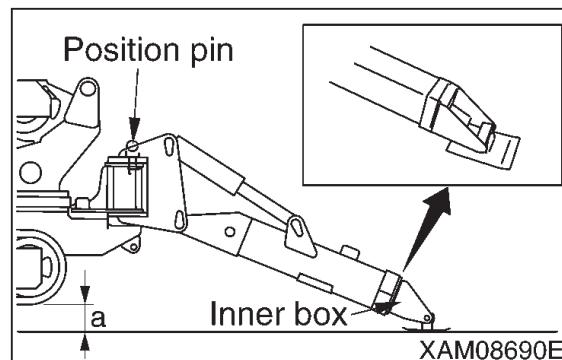


The figure represents the condition "When the crane is used with the outriggers extended at the minimum" in the rated total load chart.



☞ Outrigger minimum extension is defined as that:

1. The outrigger is set at the positioning pin position (40° front, 30° back).
2. The inner box of all the outriggers is minimised.
3. All the outriggers are placed on a level surface.
4. Approx. 50mm is assured for clearance "a" (between the outrigger bottom and crawler bottom) in the figure.



☞ If even a group of outriggers is retracted to the minimum point, all the outriggers are deemed to be extended at the minimum.

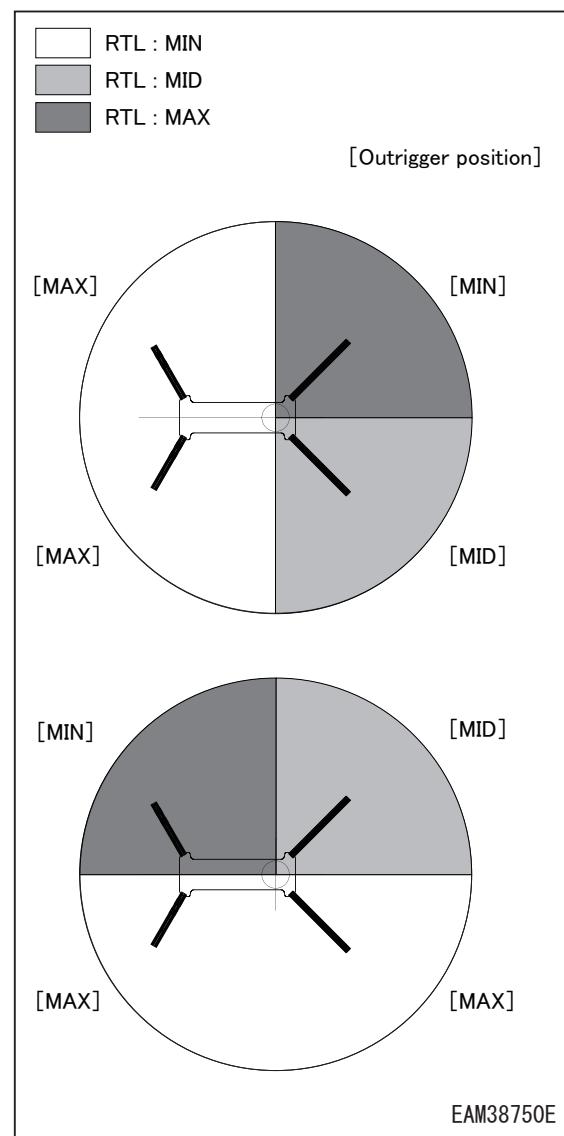
[4] CRANE WORKING AREAS DEPENDING ON OUTRIGGER SETTING CONDITIONS**⚠ WARNING**

The figure on the right shows the working areas of the crane depending on the outrigger setting conditions. If you operate the crane in the crane working prohibited zone, the machine may tip-over causing a serious injury. Never operate the crane within the crane working area prohibited zone.

The machine is not stable in some extension outrigger setting conditions. Pay careful attention during operation keeping the working radius small.

IMPORTANT

Even if the working range status display of the monitor is maximum, if the length of the outrigger is different between the front and rear, the total rated load may be limited. If the lengths of the outrigger (1) and the outrigger (2) are different, or if the lengths of the outrigger (3) and the outrigger (4) are different, see the section of “3.4 RATED TOTAL LOAD CHARTS.”

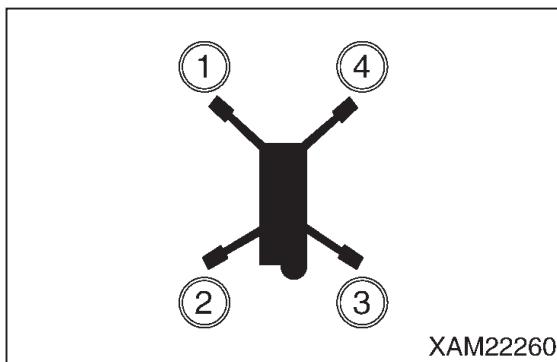


5.2.14.2 OUTRIGGER SETTING PROCEDURE

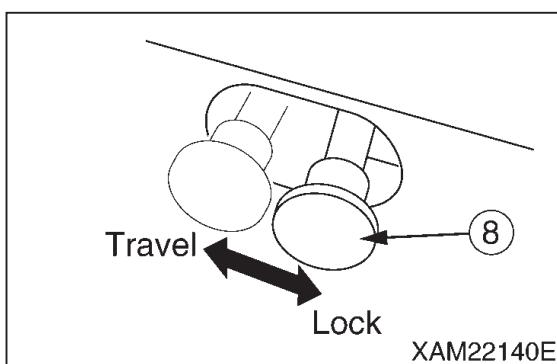
[1] TASKS TO BE PERFORMED UPON ENGINE STOP

There are four outriggers installed to the machine.

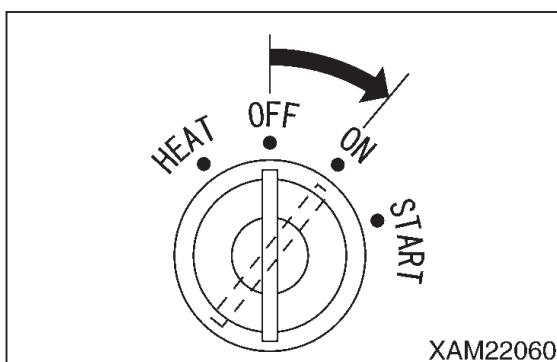
Although the setting method is described for just one outrigger (outrigger [4]), set the other three outriggers in the same way.



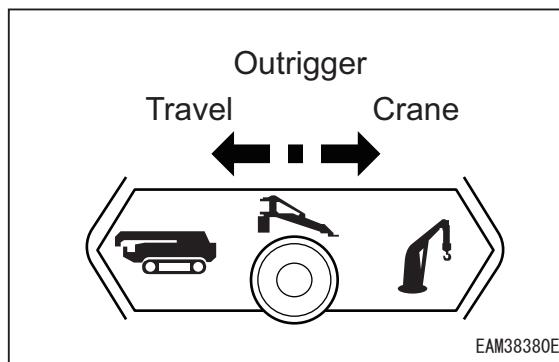
1. Operate the travelling lock lever (8) to the "LOCK" position.



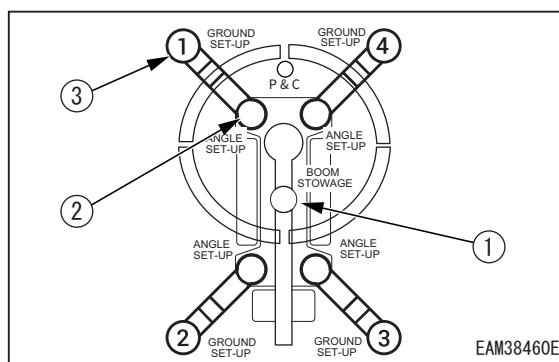
2. Turn the starter switch to the "ON" position.



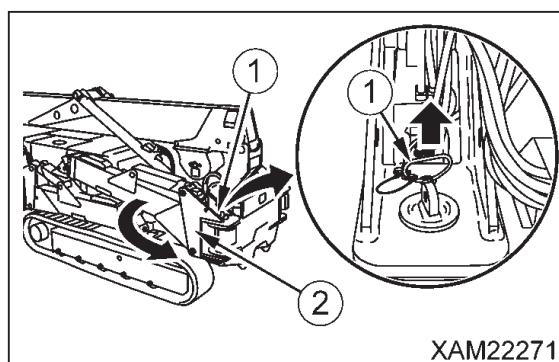
3. Operate the work selector switch (travel/outrigger/crane) on the outrigger operation panel to the "Outrigger" position.



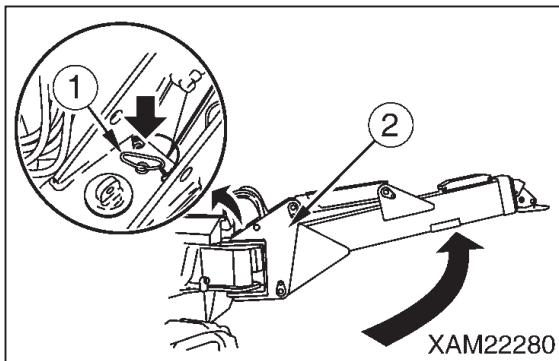
4. Verify that the boom stowage lamp (1) (green) on the outrigger display is ON.



5. Pull the position pin (1) out of the rotary (2) and rotate the rotary outward.



6. Insert the position pin (1) to the end at the position where the pin holes are aligned after rotating the rotary (2) outward.

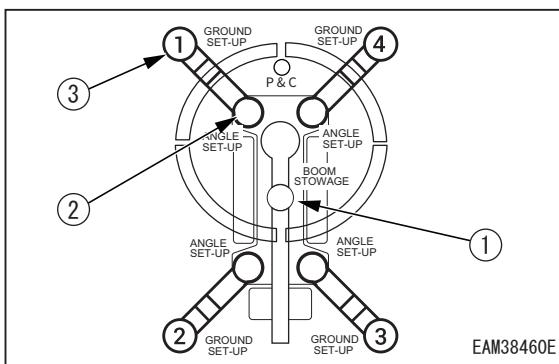


☞ The position pin (1) has a wire to prevent the loss of the pin.

7. Perform the same preparatory task to the other three outriggers.

☞ After completing the preparatory task, verify that the position pin (1) is securely inserted.

8. Verify that the four outrigger extension lamps (2) (green) on the outrigger display are ON.



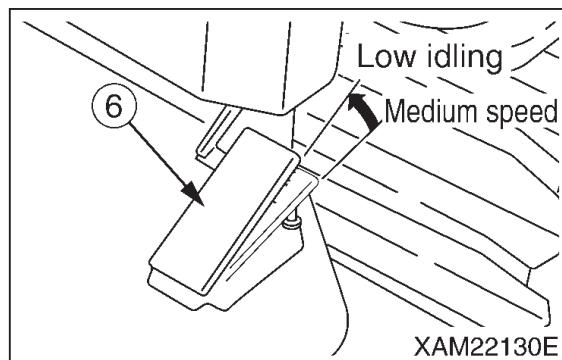
☞ The boom stowage lamp (1) and four outrigger extension lamps (2) (green) on the monitor are ON.

[2] TASKS TO BE PERFORMED AFTER STARTING ENGINE

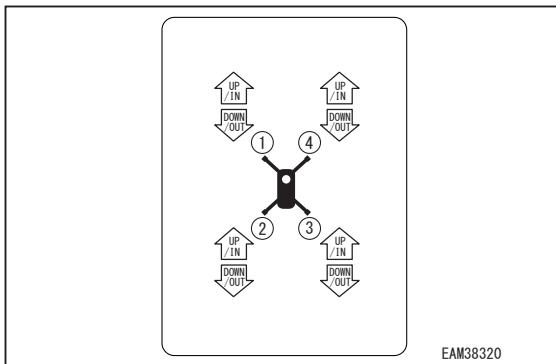
⚠ WARNING

- here are four outriggers. Be careful to operate the four individual outrigger switches correctly. Check the position on the “number plate” affixed to each outrigger against the number indicated on the “operation plate” on the switch unit. Operating the wrong outrigger may result in serious accidents.
- Set the engine speed to low speed when operating the outrigger switches. If the engine speed is set to high speed, the outriggers may operate suddenly, resulting in machine toppling or other serious accidents.
- The warning alarm buzzer sounds if the machine tilts for “3 degrees” or more when setting the outriggers. Operate the outrigger switches and adjust the machine to be levelled in which state the alarm buzzer will not sound.

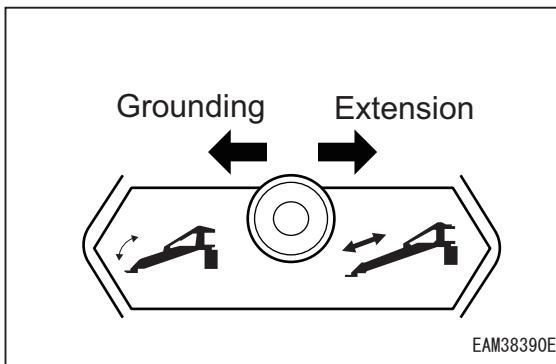
1. See “5.2.2 STARTING ENGINE” and start the engine.
2. Release your foot from the acceleration pedal (6) and change the engine speed to idling.



3. Check the number on the operation plate at the switches on the outrigger operation panel to determine which outrigger to be operated.



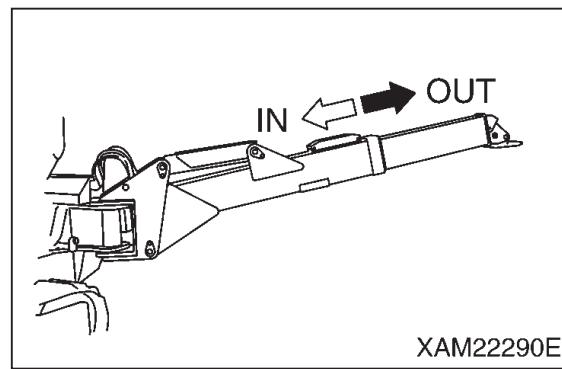
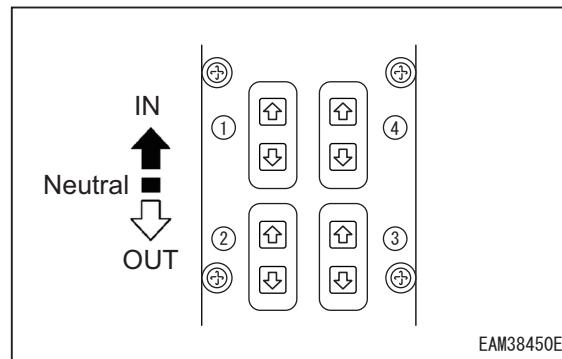
4. Push down the work selector switch (outrigger grounding/extension) to the right.



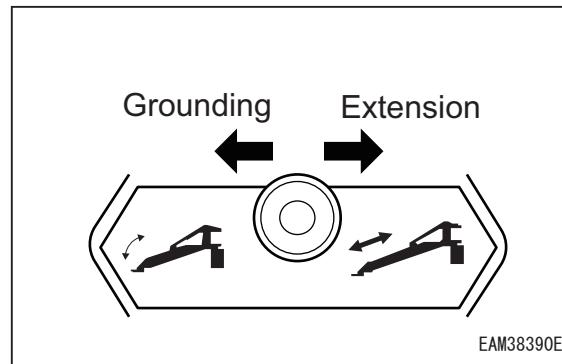
5. Push down an outrigger switch or two of them at the same time to the "OUT" side. When the outrigger extension cylinder extends and the inner box extends to the desired position, set the switch to the

"Neutral" position.

Operate the remaining switches in the same way and extend the inner box of the four outriggers to the desired position. Set the switch to the "Neutral" position.



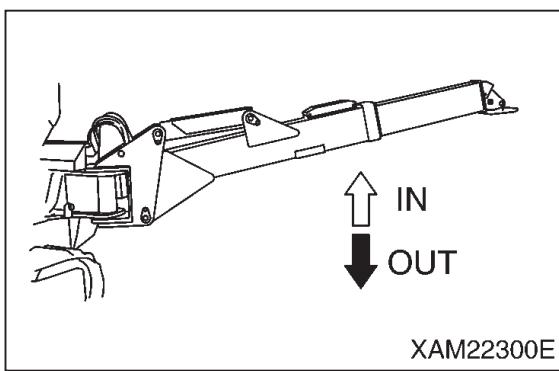
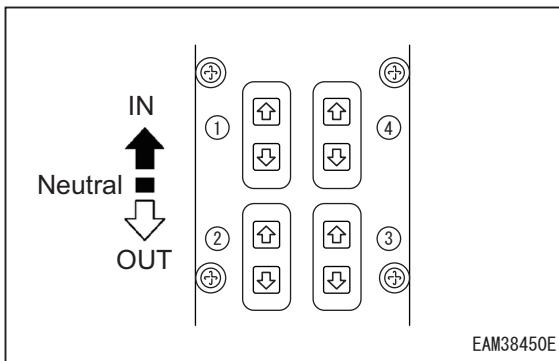
6. Push down the work selector switch (outrigger grounding/extension) to the left.



7. Push down an outrigger grounding switch or two of them at the same time to the "OUT" (downward) side. When the grounding cylinder extends and the outrigger foot is set, set the switch to

the "Neutral" position.

Operate the remaining switches in the same way and set the foot of all the four outriggers. Set the switch to the "Neutral" position.



⚠ WARNING

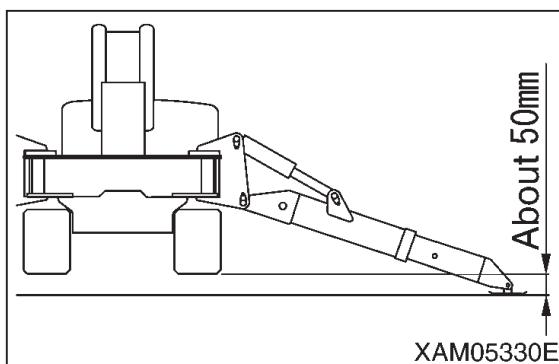
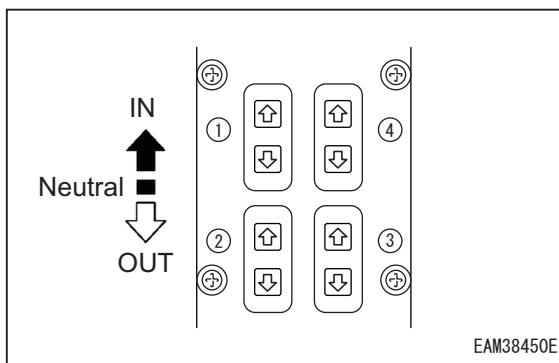
- To lift the machine, use the four outrigger grounding switches to evenly lift each of the four outriggers little by little.
- When operating two outrigger grounding switches at the same time, choose two front switches (outrigger [1] and [4]) or two rear switches (outrigger [2] and [3]). Operating two left or right switches at the same time will suddenly raise two outriggers on one side, causing tip-over of the machine.
- Do not attempt to extend the outriggers when they are in contact with the ground. This will subject the outriggers to excessive force and possibly damage them.

8. After all the outrigger foots were set, push down an outrigger switch or two of them at the same time to the "OUT" (downward) position.

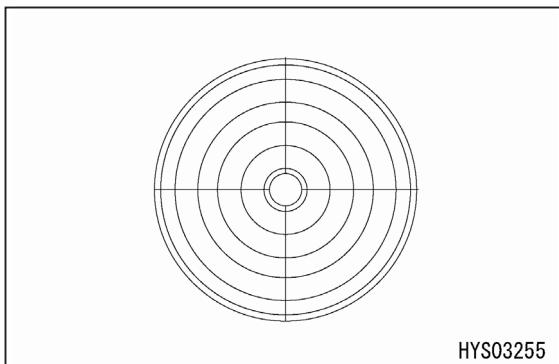
When the grounding cylinder extends and the machine is slightly raised, set the switch to the "Neutral" position.

Operate the remaining switches in the same way so that the four outriggers are raised to the same height. Set the switch to the "Neutral" position.

Repeat this operation to gradually raise the machine until the rubber tracks will be at the height of about 50 mm above the ground.

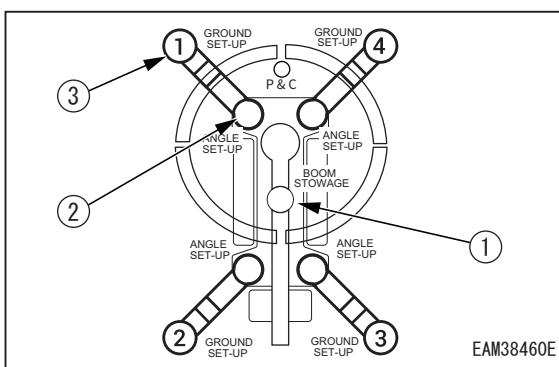


9. When the machine was raised to about 50 mm above the ground, operate the outrigger operation switches while checking the position of the indicator in the level to adjust the machine to be levelled.



10. After setting the outriggers, operate all the outrigger operation switches to the "Neutral" position.

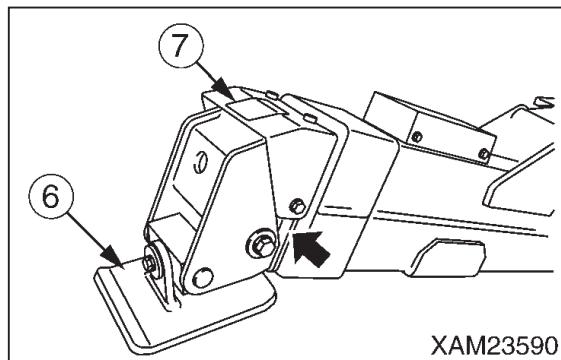
11. Verify that the four outrigger ground set-up lamps (3) (green) on the monitor are ON.



☞ On the outrigger display, all the boom stowage lamp (1), four outrigger extension lamps (2), and four outrigger ground set-up lamps (3) are lit up in green.

⚠ CAUTION

If any of the ground set-up lamps (3) is flashing in red, remove the cover (7) of the outrigger foot (6) and check if there is any foreign object pinched in the bending section.



5.2.15 WORKING WITH CRANE

INSPECTION BEFORE STARTING WORK

Check that the safety devices and crane operate properly.

- Operate each of the operation levers and switches under no load, and check that operations take place without abnormality. Repair immediately if any abnormality exists.
- Check that the safety devices such as the moment limiter, outrigger safety device, and overwinding detector / automatic stop device activate properly.

CAUTIONS WHEN HANDLING MOMENT LIMITER

- Use/store the moment limiter under the following ranges of ambient temperature.
 - ☞ Temperature of use: 10 to 50 °C Storage temperature: -20 to 60 °C
- Avoid direct sunlight so that the temperature of the moment limiter body does not exceed the above range.
- Avoid locations with strong acid or alkaline atmosphere as much as possible. Otherwise, unexpected failures may occur.

- Do not apply impact to the moment limiter body for instance by colliding with an object. Such attempt may damage the case and may result in failures and improper operations.
- Do not push the panel sheet of the moment limiter body by a force more than necessary or push with sharp object such as a tip of a screwdriver. Such act may damage the panel sheet and may result in failures and improper operations.
- Do not remove the case cover or panel sheet from, or disassemble the moment limiter body. Such act may damage case and/or panel sheet and may result in failures and improper operations.

CAUTIONS WHEN SETTING UP MOMENT LIMITER

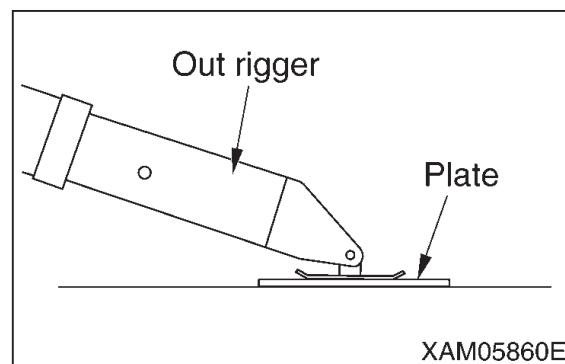
- The moment limiter calculates the moments assuming the machine is level. If you work with the crane when the machine is not level, warnings and alarms are not issued even when the rated total load is near. Always set the outrigger horizontally to the ground while looking at the level gauge.
- Before using the crane, check that the boom angle display, boom length display and actual load display of the moment limiter are displayed correctly following the crane movements. Attempt to use without correct display results in failure to obtain correct measurement result and may result in serious bodily accidents caused by reasons such as an improper operation and/or breakage of nearby equipment.
- Always make sure the wire strand setting of the moment limiter matches with the wire strand of the crane. If the wire strands do not match, always let the wire strands match by changing the wire strand setting of the moment limiter or by changing the wire strand of the crane. Attempt to use with

unmatched wire strands results in failure to obtain correct measurement result and may result in serious bodily accidents caused by reasons such as an improper operation and/or breakage of nearby equipment.

- Do not carelessly change the setting when measuring with the moment limiter. Such attempt results in failure to obtain correct measurement result and may result in serious bodily accidents caused by reasons such as an improper operation and/or breakage of nearby equipment.

PLACE CRANE ON LEVEL AND HARD SOIL

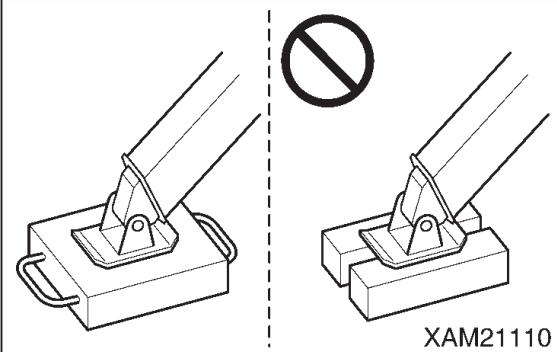
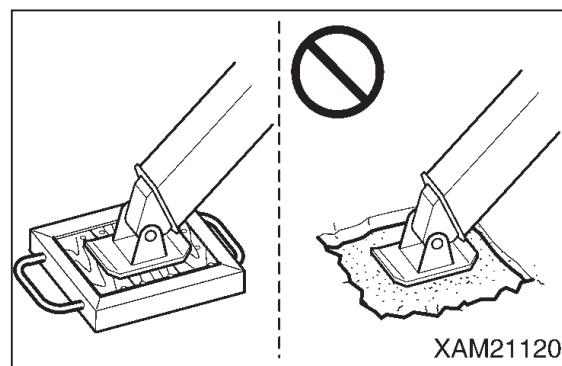
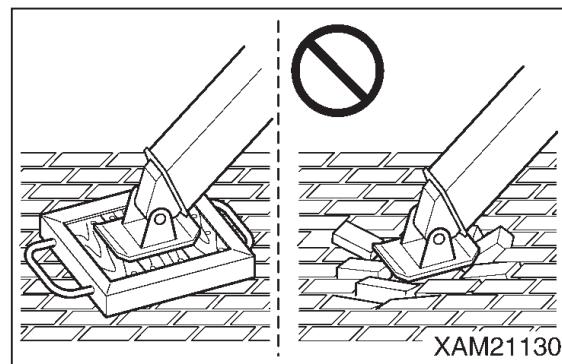
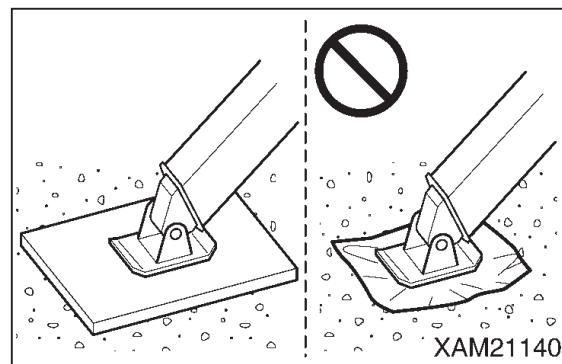
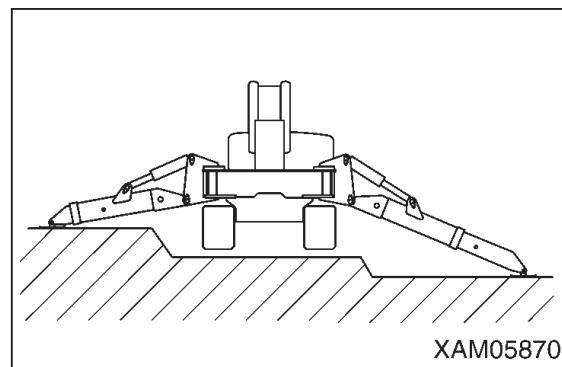
- Always place the outriggers on a level, stable and solid ground. Attempt to work with crane without outriggers firmly contacting the ground may cause the machine to trip.
- Always place all outriggers before working with crane.
- Do not set any outrigger near the location that may collapse, for instance a soft ground, roadside or drilled hole. In case the outriggers need to be placed on a soft ground for unavoidable reason, always reinforce the ground by laying a sufficiently large and strong base plate below each of all outrigger supports.



PROTECTING GROUND

Setting the outriggers on the soft ground as given below will cause the foot of the outriggers to sink in the ground, leading to the tip-over of the machine.

- Road surface with low-cost pavement (low-cost asphalt or thin concrete)
- Surface with paving stones
- Area reclaimed after excavation work
- Landfill
- Road shoulders or area close to hole such as excavation work
- Deteriorated pavement surface
- Areas where under the pavement surface is hollow due to water erosion and the top soil appears to be hard but soft in the ground
- Slope
- Place a sole plate of sufficient size with sufficient strength under the foot of all the outriggers on the soft ground to protect the ground.
- If you have to set the outriggers near the road shoulder by necessity, take secure action to prevent the collapse of the road shoulder.
- When working on the slope, level the foot of all the outriggers and the ground under the rubber tracks before setting the outriggers. Setting the outriggers with the tilted ground surface without levelling the ground surface will cause the outriggers to slip or overturn, causing serious accidents.
- If the ground is not protected or if the outriggers may sink even after protecting the ground, do not perform the crane operations.

A. Use of stable sole plate**B. Surface with low-cost pavement****C. Surface with paving stones****D. Landfill, etc.****E. Leveling ground of slope****CAUTIONS WHEN PLACING OUTRIGGER**

Always observe followings to prevent serious injuries and death accidents when placing the outriggers.

- Do not let people approach nearby when placing the outriggers. Otherwise, serious accidents for instance the outrigger support catching a foot may occur.

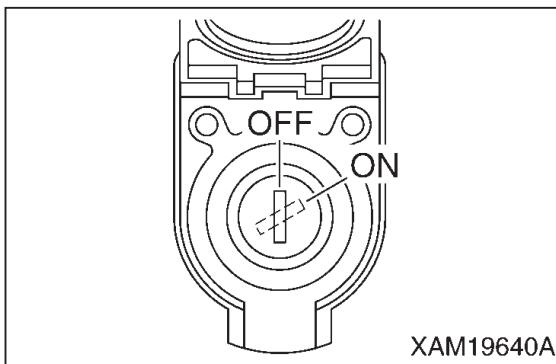


- Verify that the moment limiter override switch is at the "OFF" position.

Be sure to check that the override switch is in the "OFF" (auto) position before operating the crane.

Do not attempt to operate the crane when the override switch is in the "ON" (cancel) position.

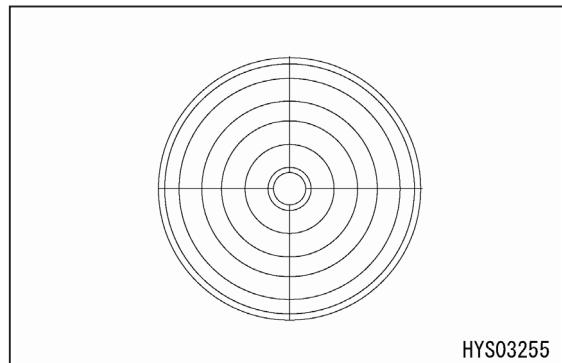
The override switch should be used in the "ON" (cancel) position only during inspection or maintenance work.



XAM19640A

- When extending the outriggers and bringing them in contact with the ground, be sure to set the outrigger rotaries to the extended position and to insert each position pin all the way in. Do not bring the outriggers into contact with the ground when the outrigger rotaries are stowed.

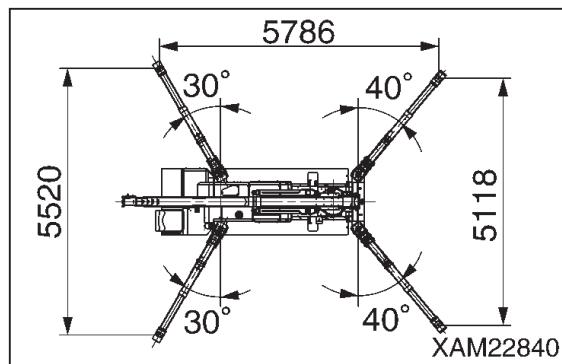
- When placing the outriggers, always keep the machine sternly level while looking at the level gauge. Occasionally view the level gauge and make sure to keep the machine level during the crane works as well.



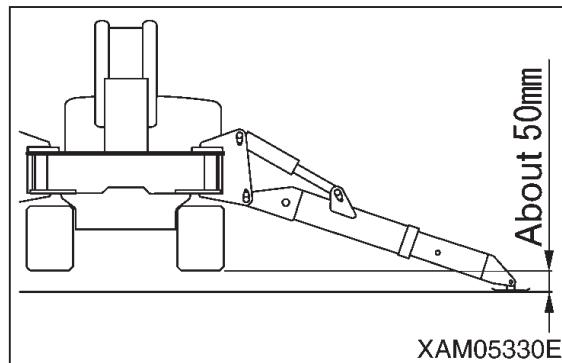
HYS03255

- Place the outriggers at a maximum extension condition as the basic rule.

If it is not possible to extend the outriggers to their maximum positions for some reason, operate the crane using the values given in the "Outrigger medium extension rated total load chart" or "Outrigger minimum extension rated total load chart" columns of the rated total load chart.



- Place the outriggers in a style that the rubber tracks are approximately 50 mm above the ground.

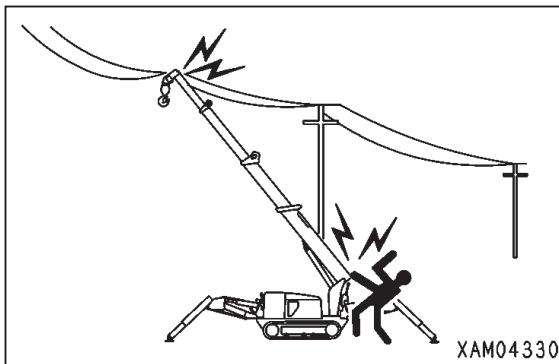
About 50mm
XAM05330E

- Make sure all of the outrigger position pins are securely fixed.

BEWARE OF OVERHEAD ELECTRICAL CABLES

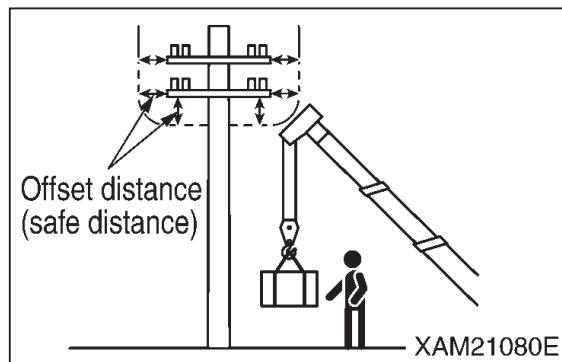
- Do not let the machine contact with electrical cables above.

High voltage cables may inflict electrical shock by mere approaching.



- Slinging operators are particularly at risk of accidents involving electrical shock. Always strictly adhere to the following points to prevent accidents:

- At worksites where there is a risk of the boom or wire ropes coming into contact with electrical cables, consult the electricity company and check that the precautionary measures (such as deploying guard personnel, covering the cables with tubes, and placing warning tags on them) stipulated by the relevant regulations have been taken before starting work.
- Wear rubber-soled shoes and rubber gloves, and be careful that body parts unprotected by rubber or other insulation do not come into contact with the wire rope or machine frame.
- Deploy a marshaller to oversee that the boom, wire rope, or machine frame does not move too close to the electrical cable. Contact the electricity company for information on the voltage of the electrical cables at the worksite.
- Maintain the distance (safe distance) shown in the following table between the boom/machine frame and electrical cables:



	Voltage of Electrical Cable	Minimum Safe Distance
Low voltage (Distribution line)	100V/200V	2m
	6,600V	2m
Special (Transmission line)	22,000V	3m
	66,000V	4m
	154,000V	5m
	187,000V	6m
	275,000V	7m
	500,000V	11m

MEASURES WHEN CHARGE ACCIDENT OCCURS

When an electrical charge accident occurred, do not panic but calm down, and apply solution by the following sequence.

1. Report

Immediately contact the electricity company or related management company to have the power turned off and for instructions on emergency procedures.

2. Evacuation of related personnel from vicinity of machine

Let the related personnel including the workers from vicinity of the machine to prevent secondary disasters.

Personnel who suffered electrical shock by holding a sling rope, guide rope or other conductor when the machine was charged should evacuate by his/her own effort.

Do not try to help such person. Otherwise, secondary electrical shock accident occurs.

3. Emergency procedure

Take the solution by following sequence in case of urgency where personnel received electrical shock because the machine was charged.

1. If the machine can be operated, immediately operate the machine to move the machine constructions away from the contact and out of the range of the cause of the charge. Be careful not to snip the distribution power cable.
2. Evacuate the machine completely away from the cause of the charge, make sure the machine is not charged, rescue the electrically shocked personnel and immediately carry to the hospital.

4. Procedures after accidents

Do not use the machine again after accidents. Otherwise, there is a risk of other unforeseen accidents occurring. Contact us or our sales service agency for repairs.

PRECAUTIONS WHEN OPERATING CRANE IN LOCATIONS WITH HIGH-POWER MICROWAVE EMITTERS

Operating the crane near high-power microwave emitting equipment such as a radar or TV/radio broadcast antennae is extremely dangerous, as induced currents may be generated in the crane structure. Microwaves may also disrupt the mechatronics.

When working in such locations, install a ground connection between the machine and earth.

Slinging operators must also wear rubber boots and rubber gloves to protect against electric shock from parts such as the hook or wire.

PAY ATTENTION TO WEATHER INFORMATION

- A risk of lightning exists in case of a thunderstorm, so abort operating the crane, immediately lower the load and retract the boom.

- Wind can cause the hoisted load to move back and forth, which could cause the machine to become unstable. If the hoisted load is affected, immediately lower the load and retract the boom.
- If the maximum instantaneous wind speed is 10 m/s or greater, abort operating the crane, immediately lower the load and retract the boom.
- Even when the maximum instantaneous wind speed is below 10 m/s, the bigger the hoisted load, the higher the hoisted load position, or the longer the boom can increase the effect from the wind. Be very careful during the work.
- When a load such as a steel plate that has a large area exposed to wind is being hoisted, the wind arriving from front/rear/side of the boom may cause the Machine to trip or damage the boom. Be very careful during the work.
- When an earthquake occurs, abort the operation and wait until it is over.

☞ The following table indicates approximate relation between the wind speed and wind effect. The wind speed mentioned in the weathercast is mean wind velocity (m/s) during 10 minutes at 10m above the ground.

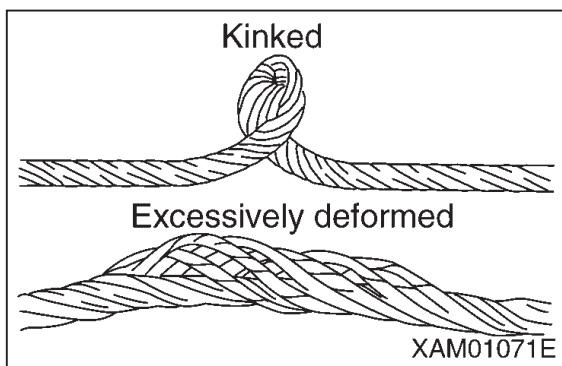
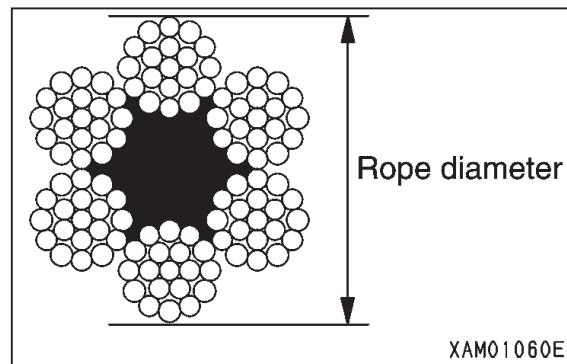
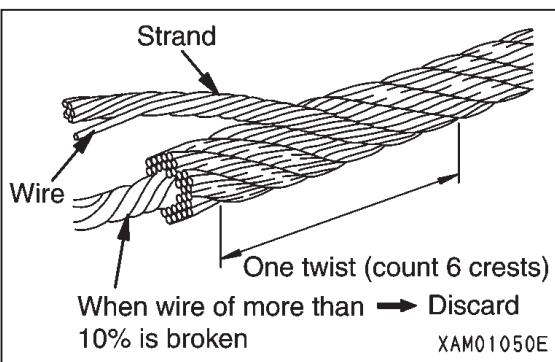
Force	Wind velocity (m/s)	Effect On Land
0	Less than 0.3	Smoke rises vertically.
1	0.3 - below 1.6	Wind motion visible in smoke.
2	1.6 - below 3.4	Wind felt on exposed skin.
3	3.4 - below 5.5	Leaves and small twigs move in constant motion.
4	5.5 - below 8.0	Dust and loose paper blow up. Small branches begin to move.
5	8.0 - below 10.8	Bushes with leaves start to sway. Waves form on the face of pond/swamp.
6	10.8 - below 13.9	Large branches begin to move. Whistling heard in electrical wires. Use of umbrella becomes difficult.
7	13.9 - below 17.2	Whole trees start to shake. Effort needed to walk against the wind.
8	17.2 - below 20.8	Twigs broke from trees. Progress impeded.
9	20.8 - below 24.5	Light structure damage. Slates blown off.
10	24.5 - below 28.5	Trees uprooted. Considerable structural damage.
11	28.5 - below 32.7	Widespread structural damage.

CAUTIONS WHEN SLINGING

- Check the following points before hoisting a load:
 - Adhere to the values given in the rated total load chart.
 - Hoist from the centre of gravity of the load.
 - Check that the wire rope of the hook block is vertical.
 - When the load leaves the ground, stop winding up the load briefly and check that the load is stable.
- Before hoisting a slung load, always check whether the sling wire rope "retainer device" on the hook block is hung correctly. If the "retainer device" is not attached, the wire rope may detach from the hook block and cause the load to fall, resulting in a serious accident.
- A larger wire rope angle when hoisting the load increases the force acting on the wire rope even when the load weight remains unchanged, possibly causing the wire rope to break. Make sure excessive force is not applied to the wire rope when slinging.
- Hoist only one load at a time. Attempting to hoist more than one load may cause the hoist fixture to hit and damage other hoisted loads, or the loads may shift and become unbalanced, resulting in serious accidents such as toppling. Do not hoist more than one load even if the total combined weight is within the rated total load.
- Hoisting long loads may cause the load to be unstable and is dangerous. With long loads, either hoist vertically using a hoisting bag or keep the hoisted load balanced by attaching ropes to either end of the load.

CAUTIONS WHEN HANDLING WIRE ROPE

- Wire ropes can wear out from constant use or old age, so be sure to inspect every time before work, and replace immediately if at or beyond the replacement standard.
- At the same time, inspect the sheave at the tip of the boom and the sheave of the hook block. Damaged sheaves accelerate the damage of the wire ropes.
- Use wire ropes specified by us.
- Otherwise, the operator may get wounded by snipped wires that are sticking out.
- Always wear leather gloves when handling the wire rope.
- Do not use a wire rope of which any of the following applies:
 - 10% or more of wires of 1 strand (except a filler wire) of a wire rope are snipped.
 - The wire rope diameter abrasion is beyond 7% of the nominal diameter.
 - Kinked wire rope.
 - Excessively deformed or corroded wire rope.
 - Affected by heat or sparks.



CAUTIONS WHEN WORKING WITH CRANE

- Be sure to verify that the moment limiter override switch is at OFF position before operating the crane.
- Do not attempt the crane operation when the moment limiter override switch is at ON position. The moment limiter override switch is permitted to be at ON position only during the inspection or maintenance works.
- Crane works are not possible when the outriggers are placed in extension condition. Also, the crane work becomes halted when an outrigger support leaves the ground during the crane work. Securely place the crane in the extension condition, and avoid operations and works that may cause the machine to vibrate when working with the crane.
- Attempt to work beyond the capacity of the machine may cause serious accidents and failures caused by for instance tripping or fluctuation. Observe the rated total load chart when working with the crane.
- Be sure to follow the usage conditions when traveling with a hoisted load. This may cause the crane to fall over resulting in serious accidents.

- Be slow when operating the crane. Sudden lever or accelerator operations may cause risks such as waggling or fall of the load and collision with the surrounding. Be especially careful to be slow during the slewing operations.
- Do not let people approach the work radius or below the load, since risks such as fall of the load and contact with the load exist. Such attempt may result in serious bodily accidents. Also, during the work, consider the fact that the working radius increases when the load is hoisted and the boom is deflected thus.
- Attempt to work with the crane even when the view is bad due to location or weather is dangerous. Ensure brightness by posting a work lamp or other illumination facility in dark places. When the view is bad because of bad weather (rain, fog, and snow), abort working and wait until the weather recovers.
- Do not use for purpose, for instance raising a person using a crane, other than the true purpose.
- If the overwinding detector alarm buzzer is heard, immediately leave your hand from the winch lever. The hook block winding stops. Then, operate the winch lever to Down (push forward) to wind down the hook block. In addition, the hook block is wound up when the boom is extended, so be sure to ensure extra clearance between the boom and the hook block during work.
- When the boom extends, the hook block is wound up. Operate the winch lever to Down (push forward) to wind down the hook block while you extend the boom.
- Whenever an overload occurs during work, lower the load by winding down the winch by setting the winch lever to Down (push forward). Do not raise or lower the boom acutely. Such attempt may cause serious accidents by tripping.

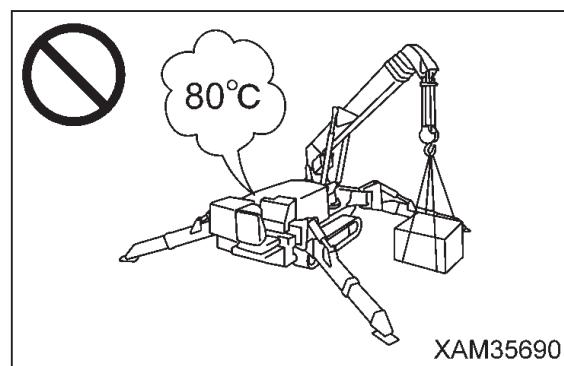
- The volume of the hydraulic oil in each of the cylinders changes depending on the temperature. By leaving idle with a load being hoisted, as the time passes by the oil temperature drops and the hydraulic oil volume decreases, and changes such as the boom derrick angle decrease and boom length decrease may occur. In that case, execute boom derricking operations and boom extension operations appropriately to correct.
- Do not leave the operation position when a load is hoisted. Lower the load before leaving the machine.
- Keep the hook block wound up when not in use. Otherwise, person near the load may collide the hook block without load.
- The operator must always ensure that no one is ever underneath a hoisted load.
- To ensure safety, any lifting carried out over the operator's seat must be operated by remote control.

HIGH HYDRAULIC OIL TEMPERATURE

If hydraulic oil temperature exceeds 80°C hydraulic hoses and seals can be damaged and leak. The leaking hydraulic oil can cause burns.

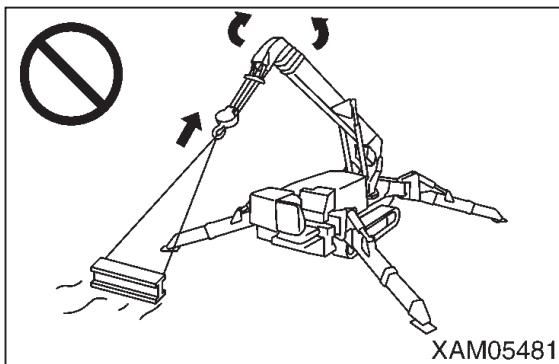
Continuous hook hoisting up and down at high speeds and high lifting heights can cause the hydraulic oil to heat up faster.

If hydraulic oil temperature exceeds 80°C stop crane operation and allow the hydraulic oil to cool.



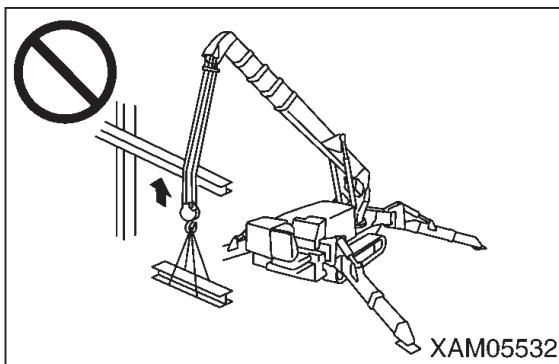
CAUTIONS WHEN OPERATING WINCH

- Do not allow persons to enter the area below the hoisted load.
- When hoisting a load, always stop once at the “takeoff” position where the hoisted load leaves the ground. Check subjects such as load stability and load force, then hoist up the load.
- Do not pull laterally, pull toward you or hoist diagonally. Such attempt may cause the crane to tumble or get damaged.



XAM05481

- Overwinding of the hook block may result in collision with the boom, snipping the wire ropes and causing the hook block and load to fall and may lead to serious accidents. Take care not to overwind the hook block.
- Be careful to prevent the wire rope and/or hoisted load from contacting an obstacle such as a tree or steel when hoisting a load. If caught by an obstacle, do not forcibly wind up the hoisted load, but untangle the caught part before winding up.



XAM05532

- Do not use the winch drum wire that is wound up irregularly. If wound up irregularly, not only the wire rope gets damaged and the lifetime is shortened, but it may snip the wire rope and causes serious accidents.

Observe the following precautions to avoid wire rope from winding up irregularly.

- Do not let the hook block tumble on the ground.
- When hoisting down the hook block for a long distance for underground works, be sure to leave more than 3 turns of the wire rope on the winch drum.

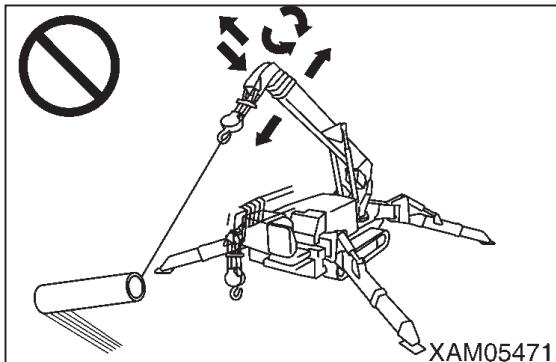
- If the wire rope is twisted and causes the hook block to turn, fully eliminate the twist before work.

Refer to the description under
“6.20.2 WINCH WIRE ROPE -
CORRECTING TWISTED ROPE.”

CAUTIONS WHEN OPERATING BOOM

- Perform boom operation lever operation as slowly as possible. Especially avoid sudden lever operations when the load is hoisted, which may cause the load to sway and give large impact to the machine, and thus may damage the crane or trip the Machine.
- When the boom is lowered, the working radius increases, and the rated total load that can be hoisted decreases. When working while raising/lowering the boom, pay extra attention so that the mass of the load at the time the boom is most lowered does not cause overloading.

- Pulling of the load laterally by raising/lowering, and/or extracting/retracting the boom is prohibited. Do not attempt to do the above under any circumstances.

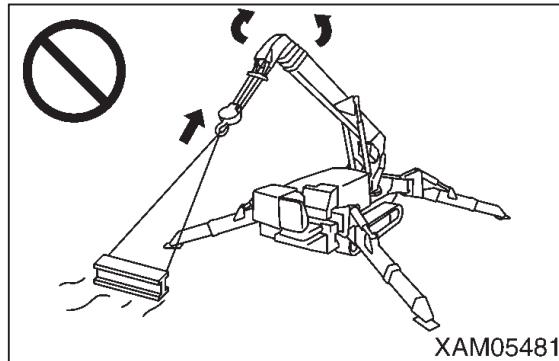


- When telescoping the boom, be cautious while checking the winding of the hook block.
- When the boom is extended, the working radius increases, and the rated total load that can be hoisted decreases. When working while extending/retracting the boom, pay extra attention so that the mass of the load at the time the boom is most lowered does not cause overloading.

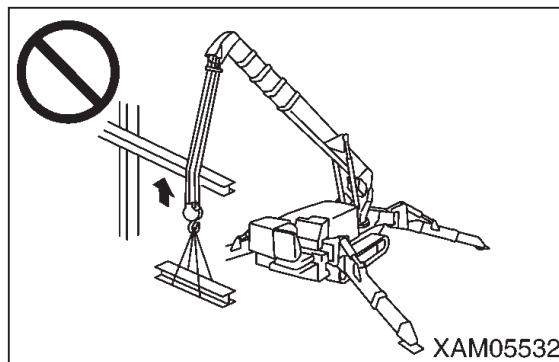
CAUTIONS DURING SLEWING OPERATION

- Check the safety in the vicinity and sound the horn before slewing.
- If the boom derrick angle is small, be careful not to let the boom hit the operator or the machine.
- Perform the slewing lever operation as slowly as possible. Make sure to start smoothly, slew at low speed, and stop quietly. Especially avoid sudden lever operations when the load is hoisted, which may cause the load to sway and cause the Machine to lose balance, and thus may damage the crane or trip the Machine.

- Attempts to pull the load towards the machine or let the load stand up by slewing operation are strictly prohibited. Do not attempt to do the above under any circumstances.



- Be careful to prevent the wire rope and/or hoisted load from contacting an obstacle such as a tree or steel when hoisting a load or slewing. If caught by an obstacle, do not forcibly wind up the hoisted load, but untangle the caught part before winding up.



- Certain outrigger extension condition may cause the boom to hit an outrigger and cause the crane to be damaged or the machine to trip. Be careful to prevent the boom from hitting outriggers during slewing operation.

COOPERATION HOISTING IS PROHIBITED AS A GENERAL RULE

Cooperative hoisting, where two or more cranes are used to hoist a single load, is prohibited as a general rule.

Cooperative hoisting is a highly dangerous operation that may invite tumbling of the Machine due to deviated center of gravity, fall of hoisted load and damage of the boom.

If cooperation hoisting is required for unavoidable reasons, discuss and establish a work scheme under the responsibility of the user, let the worker fully acknowledge the work method and procedures, and only proceed under the direct leadership of the work supervisor.

Also, observe the following cautions:

- Use the cranes of same model.
- Choose the Machine model that can handle sufficiently larger load than the load to be hoisted.
- Make sure only one person gives signals.
- Limit the crane operations to single operations as a rule, and do not attempt any slewing operation.
- Appoint one responsible sling operator who is most experienced.

CAUTIONS FOR WORK AT WORKPLACE WHERE LIFT BELOW GROUND LEVEL IS PERFORMED

- When hoisting down a wire rope in work underground, leave at least three loops of wire rope on the winch drum.
- Make sure to give signals.
- Perform crane operation with extra care.

5.2.16 BEFORE CRANE OPERATIONS

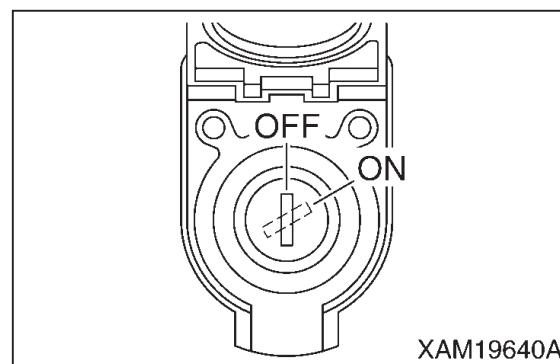
⚠ CAUTION

- Verify that all the lamps on the outrigger display are lit up in green before performing the crane operation. The crane cannot be operated if any of the four outrigger extension lamps and four outrigger ground set-up lamps is flashing in red.
- Set the travelling lock lever to the “LOCK” position when operating the operation levers of the crane system and outrigger switches.

- When loosening the stowing of the hook block, be careful not to topple the entire hook block sideways on the ground by loosening the wire rope too much. This will cause irregular winding on the winch drum.
- When loosening the stowing of the hook block, the hook block may slew and interfere with the peripheral devices, resulting breakage of the devices. Pay sufficient attention around the hook block.

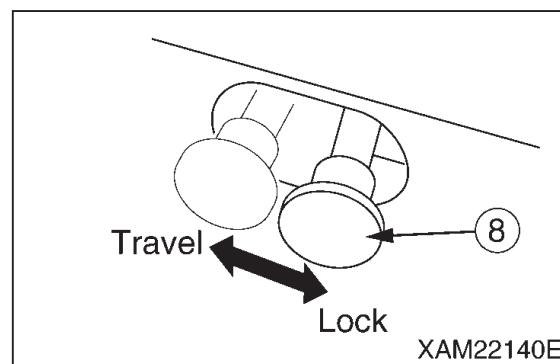
Perform the following operations before crane operation.

1. Confirm that the moment limiter override switch is set to the “OFF” position. The safety device operation will not stop if the switch is at the “ON” position.

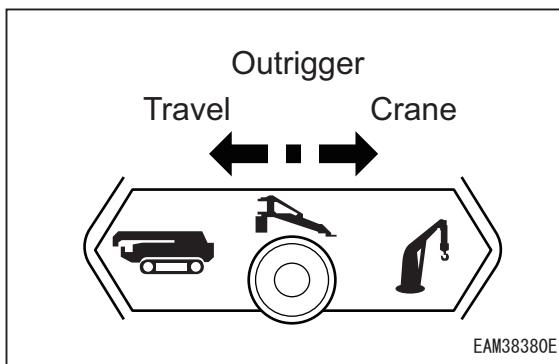


☞ If the moment limiter override switch is set to the “ON” position, the working status lamp will flash in red, and the warning alarm buzzer will sound.

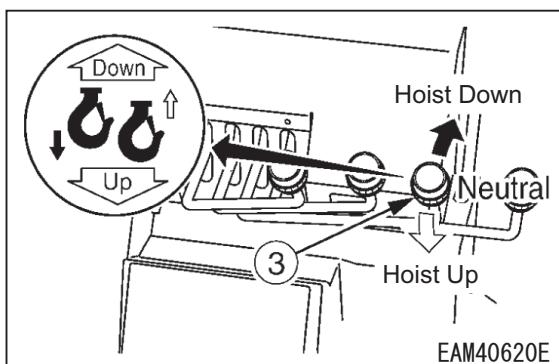
2. Operate the travelling lock lever (8) to the “LOCK” position.



3. Operate the work selector switch (travel/outrigger/crane) on the outrigger operation panel to the “Crane” position.



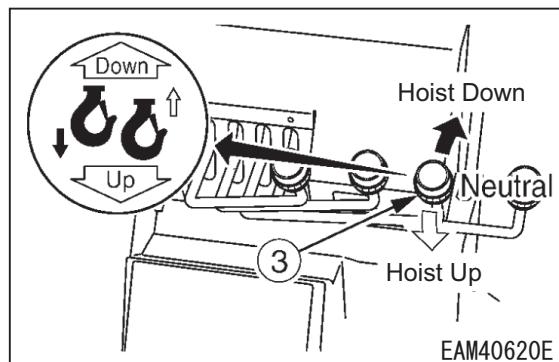
4. Operate the winch lever (3) to the “DOWN” (push forward) side to loosen the hook block from the stowing position.



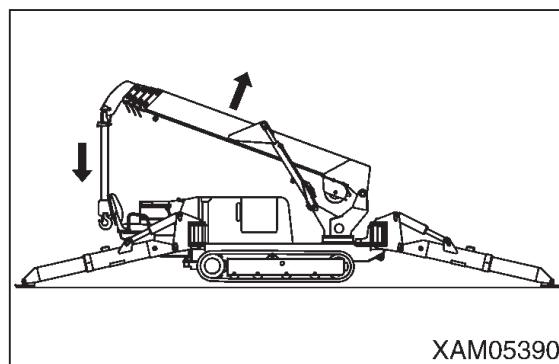
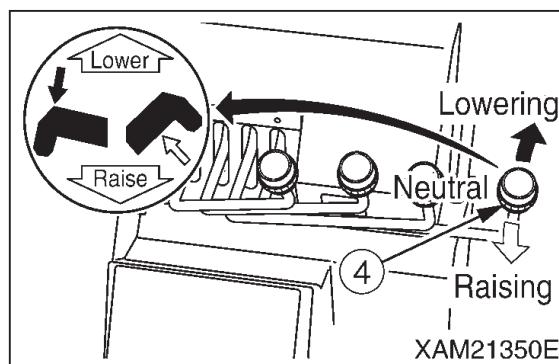
5.2.17 CRANE OPERATION POSTURE

Take the crane operation posture by following the procedure below when switching to the operation from the state described in “5.2.16 BEFORE CRANE OPERATIONS.”

1. Operate the winch lever (3) to the “DOWN” (push forward) side and hoist down the hook but not to let the hook block touch the ground.



2. Operate the boom derricking lever (4) to the “RAISE” (pull toward you) side and raise the boom to the angle where the hook block is not over wound and not touching the ground.



5.2.18 HOOK HOISTING UP/DOWN OPERATION

⚠ WARNING

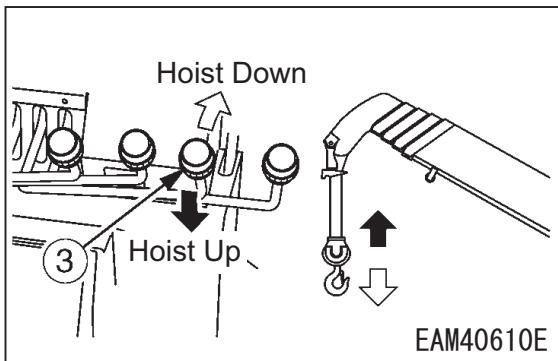
- With the boom deflection, the hoisted load slightly shifts forward. Notify the workers around such as slinging operators.
- If the hook block was hoisted too much, overwinding will be detected. The alarm buzzer sounds. When the alarm buzzer was heard, operate the winch lever immediately to the “Neutral” position and stop hoisting up the hook.
- When hoisting down the hook for long distance for underground works, be sure to leave more than three turns of the wire rope on the winch drum.

⚠ CAUTION

Do not let the hook block touch the ground. The winch drum will wind irregularly, damaging the wire rope.

Operate the winch lever (3) as follows;

- Down : Push the lever forward “DOWN”.
- Neutral : Release your hand from the lever. The lever will return to the “Neutral” position and the hoisting up/down of the hook block stops.
- Up : Pull the lever to the “UP” side toward you.



- Adjust the winch hoisting up/down speed with the winch lever and stroke of the acceleration pedal.

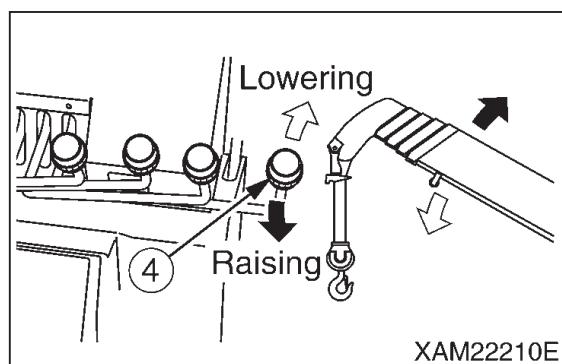
5.2.19 BOOM DERRICKING OPERATION

⚠ WARNING

- Operate the boom derrick lever as slowly as possible. Sudden lever operation especially while hoisting a load will cause the load to slew, giving a great impact to the machine, and thus may break the crane or overturn the machine.
- Lowering the boom increases the working radius and the rated total load that can be hoisted decreases. Be extremely careful so that the load weight will not be overloaded with the boom most lowered when working by derricking the boom.

Operate the boom derrick lever (4) as follows.

- Lower : Push the lever forward to the “LOWER” side.
- Neutral : Release your hand from the lever. The lever goes back to the “Neutral” position and the boom derrick stops.
- Raise : Pull the lever toward you to the “RAISE” side.



- Adjust the boom derrick speed with the boom derrick lever and the stroke of the acceleration pedal.

5.2.20 BOOM TELESCOPING OPERATION

⚠ WARNING

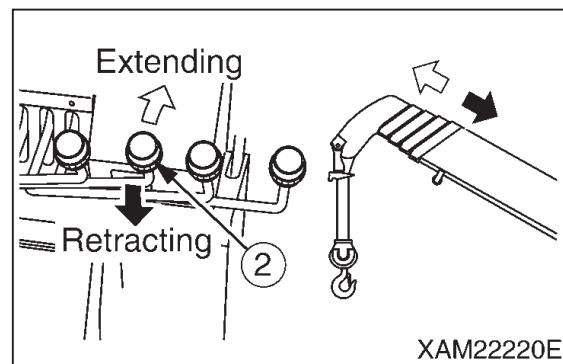
- Operate the boom telescoping lever as slowly as possible. Sudden lever operation especially while hoisting a load will cause the load to slew, giving a great impact to the machine, and thus may break the crane or overturn the machine.
- Do not pull the load horizontally or pull in the load by telescoping the boom.
- Extending the boom increases the working radius and the rated total load that can be hoisted decreases. Be extremely careful so that the load weight will not be overloaded with the boom most extended when working by telescoping the boom.
- When the boom is extended, the hook block is lifted. If the alarm buzzer of the overwinding detector is heard during the boom extending operation, return the boom telescoping lever immediately to the “Neutral” position and stop the boom extending operation.

⚠ CAUTION

- The hook block is lifted up or down while telescoping the boom. Perform the winch operation at the same time to adjust the hook block height.
- When the boom is maintained extended for a long time, the boom slightly retracts due to the temperature change in the hydraulic oil. In this case, extend the boom as needed.

Perform the boom telescoping lever (2) as follows.

- Extend: Push the lever forward to the “EXTEND” side.
- Neutral: Release your hand from the lever. The lever returns to the “Neutral” position and the boom telescoping stops.
- Retract: Pull the lever toward you to the “RETRACT” side.



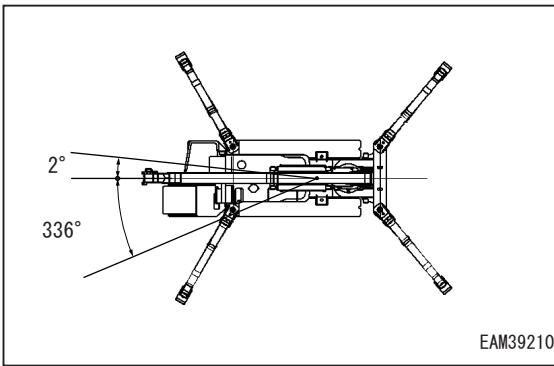
☞ Adjust the boom telescoping speed with the boom telescoping lever and the stroke of the acceleration pedal.

5.2.21 SLEWING OPERATION

⚠ WARNING

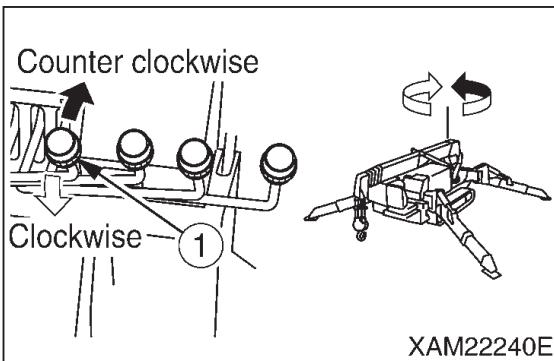
- Check the safety around and sound the horn before slewing.
- Operate the slewing lever as slowly as possible. Start smoothly, slew at low speed, and stop gently. Sudden lever operation especially while hoisting a load will cause the load to slew, causing the loss of stability in the machine, and thus may break the crane or overturn the machine.
- Even if the outriggers are set normally, some directions have lower stability when slewed for 360 degrees. Be extremely careful when slewing while hoisting a load.

- Depending on how outriggers are extended, the hoisted load may hit an outrigger during the slewing operation, breaking the crane or tip-over the machine. Be careful not to let the hoisted load hit an outrigger.
- If the boom derrick angle is less than 14°, it cannot operate slewing between 336° and 2° to avoid collision with the operator. However, when operated by remote control, it can operate slewing 360° regardless of the boom derrick angle.



Operate the slewing lever (1) as follows.

- Slew counterclockwise (left) : Push the lever forward to the "LEFT" side.
- Neutral: Release your hand from the lever. The lever returns to the "Neutral" position and the slewing stops.
- Slew clockwise (right) : Pull the lever toward you to the "RIGHT" side.



☞ Adjust the boom slewing speed with the slewing lever and the stroke of the acceleration pedal.

5.2.22 ACCELERATION OPERATION

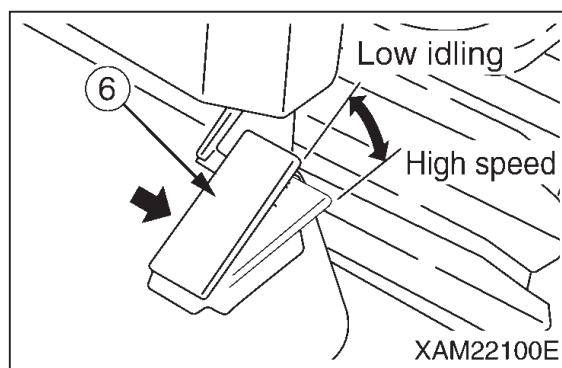
⚠ WARNING

Accelerating the operation speed of the crane units more than is necessary is dangerous.

⚠ CAUTION

Decrease the speed in the beginning or near the end of an operation. Change the speed to low speed or high speed according to the load.

Operate the acceleration pedal (6) as follows.



- Low idling: Release your foot from the pedal. The engine speed decreases and the operation speed of the crane units slows down.
- Full speed: Fully step on the pedal. The engine speed increases, and the operation speed of the crane units accelerates.
- ☞ Step on the pedal to the position of the engine speed necessary for the task.

5.2.23 CRANE STOWING OPERATION

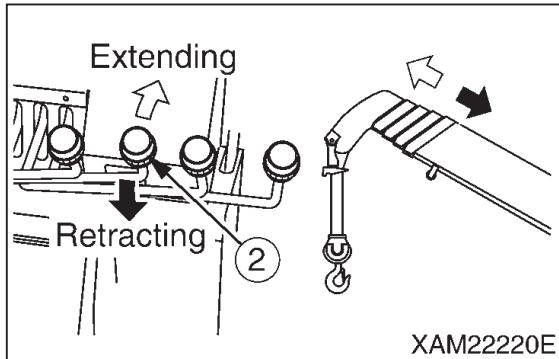
⚠ WARNING

The hook stowage switch cancels the auto stop function of the overwinding detector. Operate the winch lever carefully not to let the hook block hit the boom when stowing the hook block.

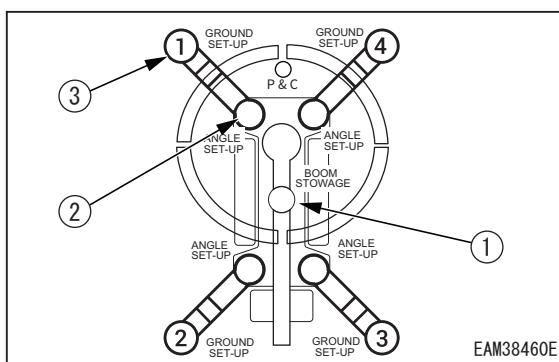
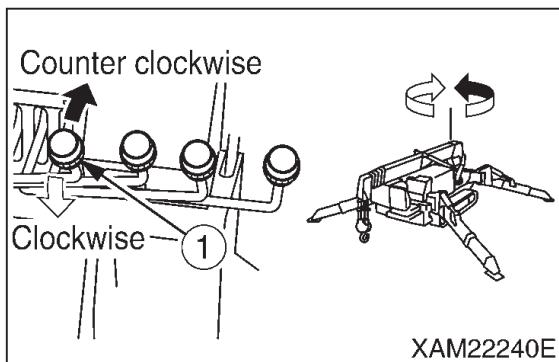
⚠ CAUTION

- Stop the slew of the hook block before stowing the hook block.
- When stowing the hook block, do not topple the entire hook block sideways on the ground by loosening the wire rope too much. This will cause the irregular winding on the winch drum.
- The boom “retracting” operation will lift down the hook block. The hook block also lifts down with the boom “lowering” operation. Hoist up the hook at the same time so that the hook block will not touch the ground or interfere with the machine.
- Stow the boom securely into the stowing position. After stowing the boom, verify that the boom stowage lamp on the outrigger display lights up in green. If the boom stowage lamp does not light up, the outriggers cannot be stowed. If the boom stowage lamp does not light up, lower the boom to the maximum or slew the boom to verify that the boom stowage lamp lights up.

1. Operate the boom telescoping lever (2) to the “RETRACT” (pull toward you) side to fully retract the boom.

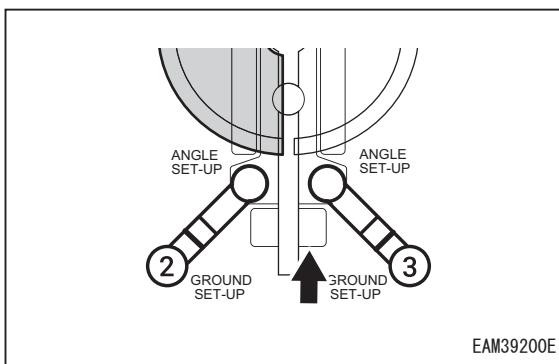
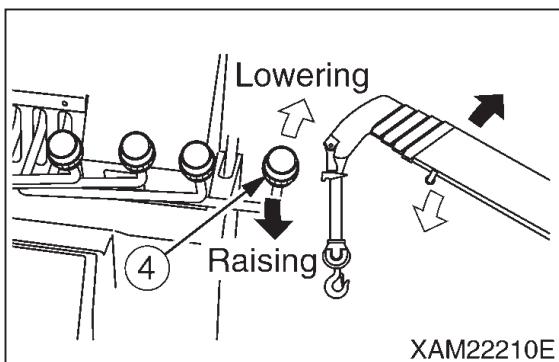


2. Operate the slewing lever (1) to the “LEFT” or “RIGHT” side so that the boom slews to the centre of the machine.



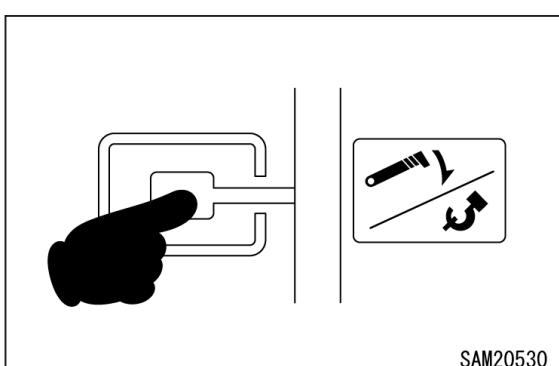
☞ At this time, check that the boom stowage lamp (1) is lit yellow. If it is lit red, adjust the boom slewing angle.

3. Operate the boom derricking lever (4) to the "LOWER" (push forward) side and lower the boom until it automatically stops.



☞ If the crane operation stops automatically due to operator protection restriction, the operator protection restriction display will flash red.

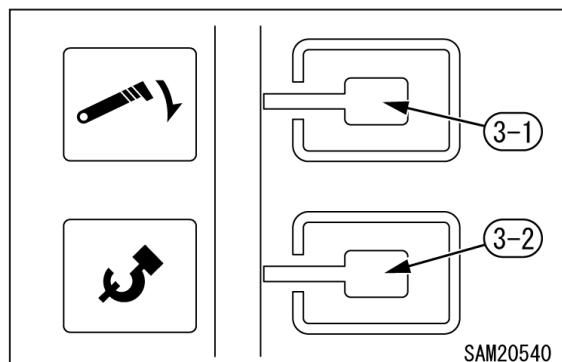
4. Push the hook stowage/boom stowage switch on the home screen.



☞ If the crane operation stops automatically due to operator protection restriction, the message display and alarm buzzer will sound intermittently to notify the operator. Follow the instructions and check the position of the boom before stowing.

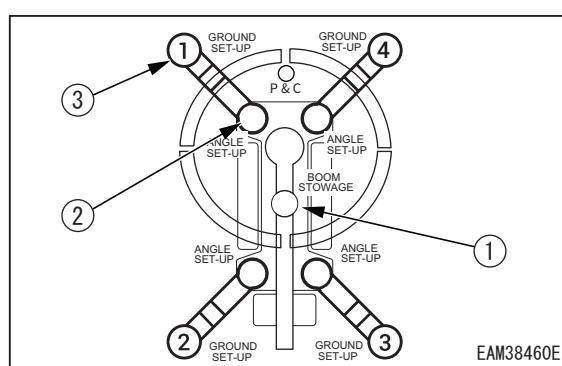
If the boom cannot be stowed, no message will be displayed and the alarm buzzer will not sound. Check the boom slewing angle, boom derricking angle, etc.

5. With the boom stowage switch (3-1) on the monitor depressed, operate the boom derricking lever (4) to the "LOWER" (push forward) side to stow the boom in its fully lowered state.



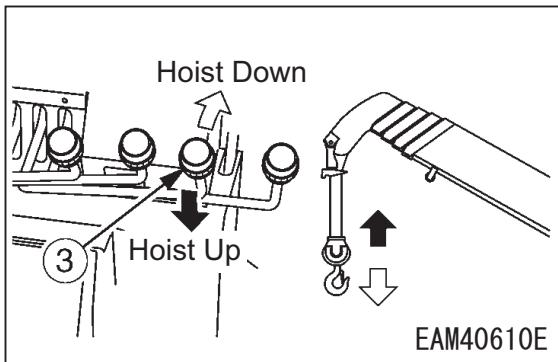
☞ The boom is stowed only while the switch is depressed.

6. Check to confirm that the Boom stowage ramp (1) is light in green. If the light is light in yellow or light in red, the boom has not been fully stowed. Check by adjusting the slewing angle and boom derricking angle.



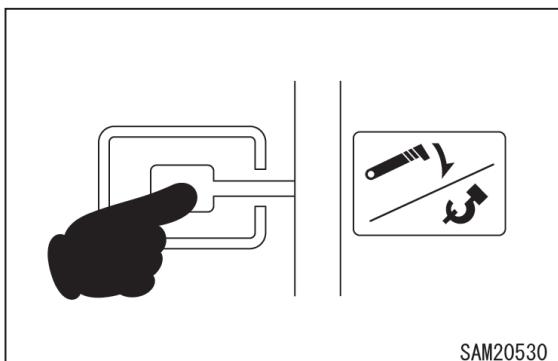
- Green light : Boom is stowed
- Yellow light : Only stowed at slewing stowage position
- Red light : Not yet stowed in slewing stowage position or boom fully lowered position.

7. Operate the winch lever (3) to the "UP" (pull toward you) side and hoist up until the hook block automatically stops (overwinding).

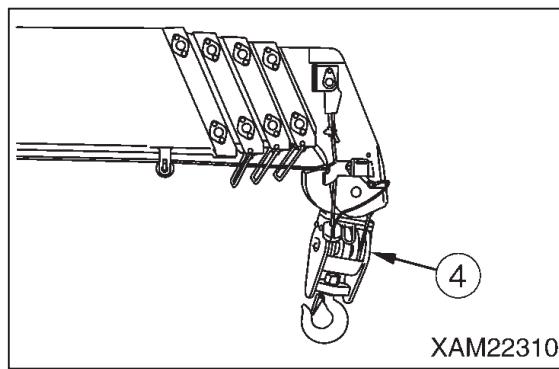
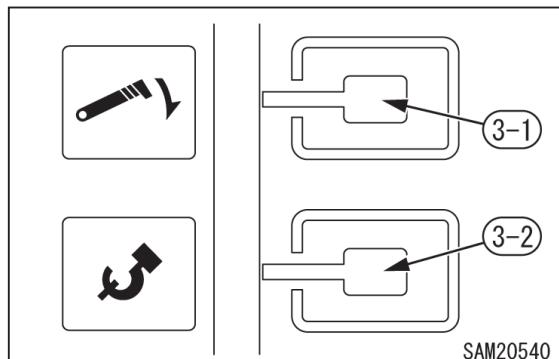


☞ Hoisting the hook block too much will result in the detection of overwinding. Then the alarm buzzer is heard and the hook hoisting up operation automatically stops.

8. Push the hook stowage/boom stowage switch on the home screen.



9. With the hook stowage switch (3-2) on the monitor depressed, operate the winch lever (3) to the "UP" (pull toward you) side to stow the hook at the bottom of the boom end.



☞ The hook is stowed only while the switch is depressed.

5.2.24 OUTRIGGER STOWING OPERATION

⚠ WARNING

- Do not let people approach toward the machine when stowing the outriggers.
- Staying around the machine may result in serious accidents such as getting caught between an outrigger and the main unit of the machine.
- Verify that there is nothing under the rubber tracks when stowing the outriggers. If there is any object under the rubber tracks, the machine may overturn and serious accidents may occur when stowing the outriggers.

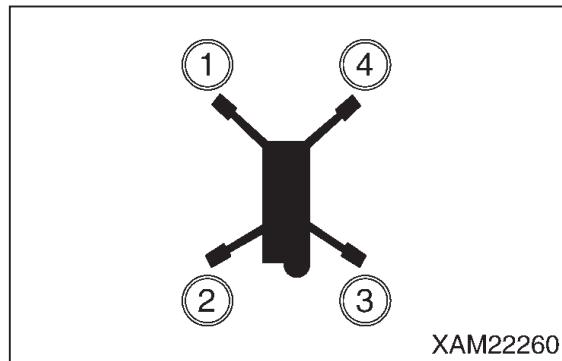
- Stop the engine for operation except for extending/setting the outrigger cylinders. The third person touching an outrigger may result in sudden movement of the outrigger cylinder, which may lead to serious accidents.
- When the position pin is removed, the outrigger loses the support and rotates. Always hold the outrigger with one hand when removing the position pin.
- Do not put your hands or fingers around the gaps of movable areas when stowing the outriggers. Your hands or fingers may get caught, and it may lead to serious accidents.
- Insert the position pin to the end when stowing the outriggers.
- When lowering the raised machine, operate the four outrigger switches so that the four outriggers are lowered little by little. Suddenly retracting two outriggers just on the right side or left side will cause instability in the machine and it can overturn the machine.
- Do not perform the outrigger extending operation after they are set on the ground. Doing so applies unreasonable force on the outriggers, resulting in the outrigger breakage.
- Always set the travelling lock lever to the “LOCK” position when operating the outriggers.

⚠ CAUTION

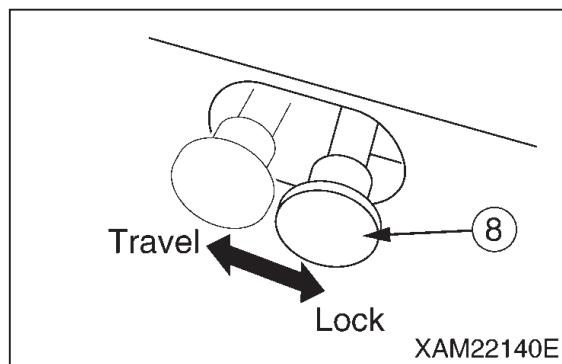
- Always keep the boom at the “lowest position and slew and stow position” when operating the outriggers. The outriggers cannot be operated if the boom is not stowed completely. (Verify that the boom stowage lamp (green) on the outrigger display is ON.)
- Operate the work selector switch (travel/outrigger/crane) on the outrigger operation panel to the “Outrigger” position.

[1] TASKS TO BE PERFORMED AFTER STARTING ENGINE

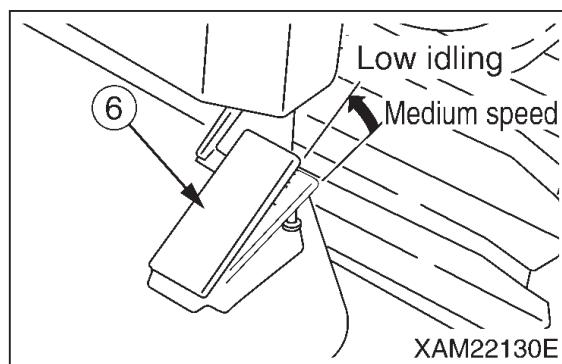
Although the stowing method is described for just one outrigger (outrigger [4]), stow the other three outriggers in the same way.



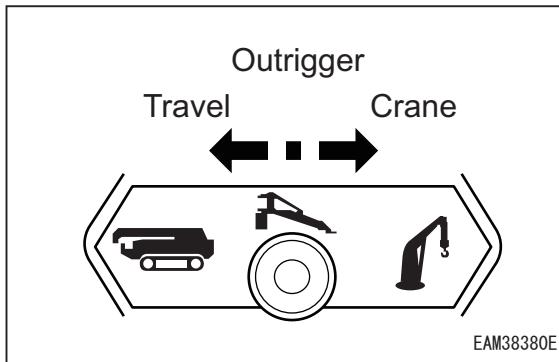
1. Operate the travelling lock lever (8) to the “LOCK” position.



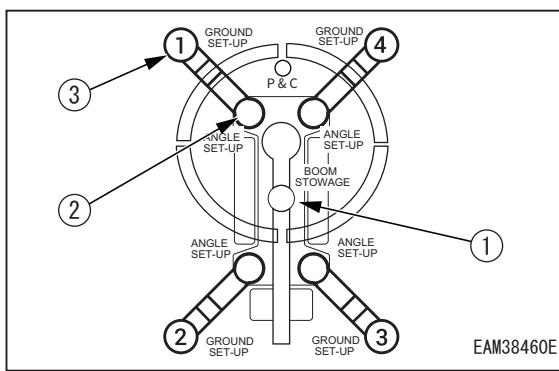
2. See “5.2.2 STARTING ENGINE” and start the engine.
3. Release your foot from the acceleration pedal (6) and change the engine speed to idling.



4. Operate the work selector switch (travel/outrigger/crane) on the outrigger operation panel to the “Outrigger” position.



5. Verify that the boom stowage lamp (1) (green) on the outrigger display is lit up.

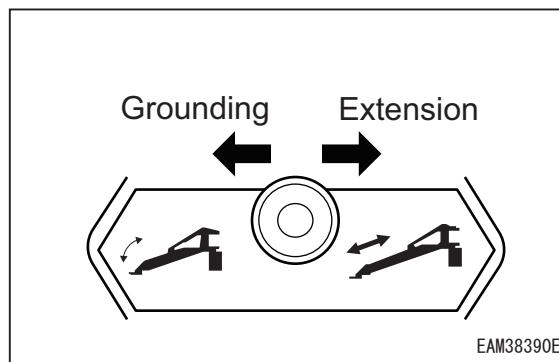


⚠ WARNING

When operating two outrigger grounding switches at the same time, choose two front switches (outrigger [1] and [4]) or two rear switches (outrigger [2] and [3]). Operating two left or right switches at the same time will suddenly raise two outriggers on one side, causing tip-over of the machine.

6. Check the number on the operation plate at the switch section on the outrigger operation panel to determine which outrigger to be operated.

7. Push down the work selector switch (travel/outrigger/crane) (outrigger grounding/extension) to the left.

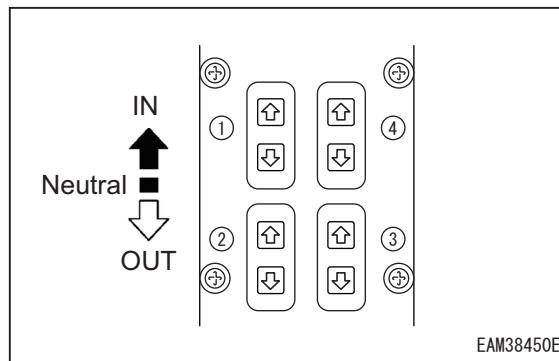


8. Push down an outrigger switch or two of them at the same time to the “ON” (upward) side.

When the outrigger grounding cylinder retracts and the machine starts to go down, return the switch to the “Neutral” position.

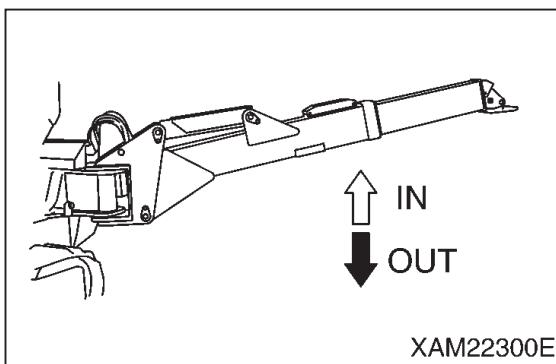
Operate the remaining switches in the same way and lower all the four outriggers to the same height. Return the switch to the “Neutral” position.

Repeat this operation to gradually lower the machine until the rubber tracks are totally ground.

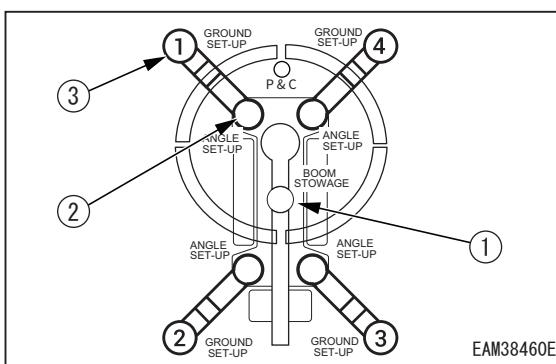


9. When the left and right rubber tracks are completely set on the ground, push down again an outrigger grounding switch or two of them at the same time to the "IN" (upward) side.

When the grounding cylinder completely retracts and the top box goes up to the upper limit, release your finger from the outrigger grounding switch.

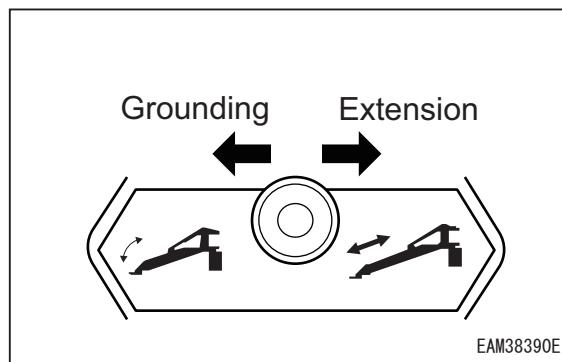


10. Verify that the four outrigger ground set-up lamps (3) on the monitor are flashing in red.



☞ On the outrigger display, the boom stowage lamp (1) (green), four outrigger extension lamps (2) (green) and four outrigger ground set-up lamps (3) (red) are lit up.

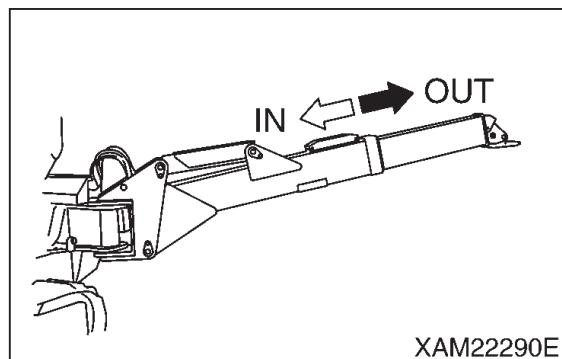
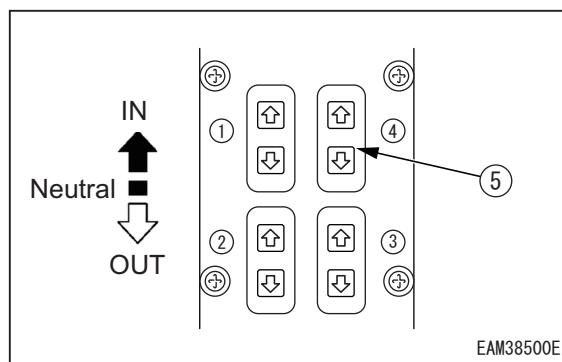
11. Push down the work selector switch (outrigger grounding/extension) to the right.



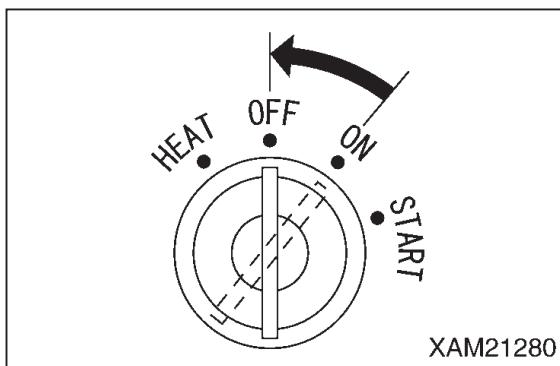
12. Push down an outrigger switch or two of them at the same time to the "IN" (upward) side.

When the extension cylinder fully retracts and the inner box is at its shortest, return the switch to the "Neutral" position.

Operate the remaining switches in the same way and make the inner box of the four outriggers to their shortest. Return the switch to the "Neutral" position.

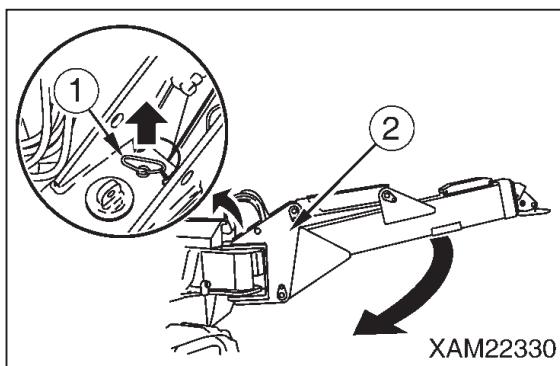


13. Turn the starter switch to the "OFF" position the engine stops.

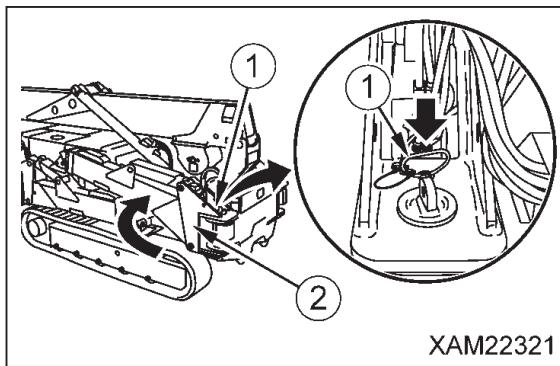


[2] TASKS TO BE PERFORMED UPON ENGINE STOP

1. Pull the position pin (1) out of the rotary (2) and rotate the rotary inward.



2. Insert the position pin (1) to the end at the position where the pin holes are aligned after rotating the rotary (2) inward.



- ☞ The position pin (1) has a wire to prevent the loss of the pin.

3. Stow the other three outriggers in the same way.

- ☞ After stowing the outriggers, verify that the position pin (1) is securely inserted.

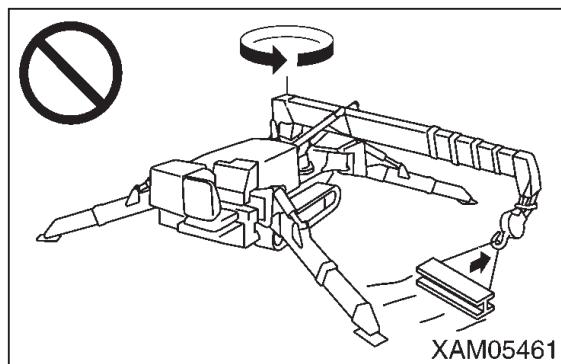
5.2.25 DOS AND DON'TS DURING CRANE OPERATIONS

⚠ WARNING

- Always set the outriggers on the levelled solid ground when performing the crane operations.
- Never perform the crane operations without setting the outriggers. The machine will be unstable and overturn, leading to serious accidents.
- See the cautions given in "Chapter 2 SAFETY" besides the dos and don'ts in this section.

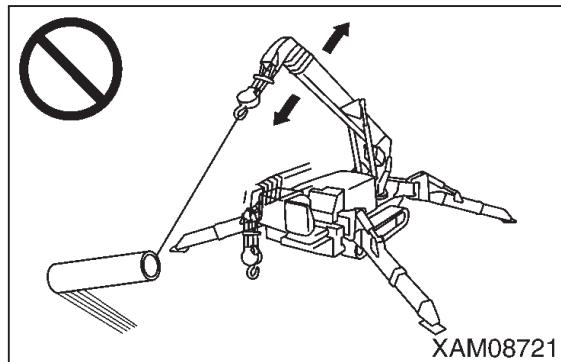
[1] DO NOT OPERATE WITH SLEWING FORCE

Pull in or lifting the load with slewing operation is prohibited.



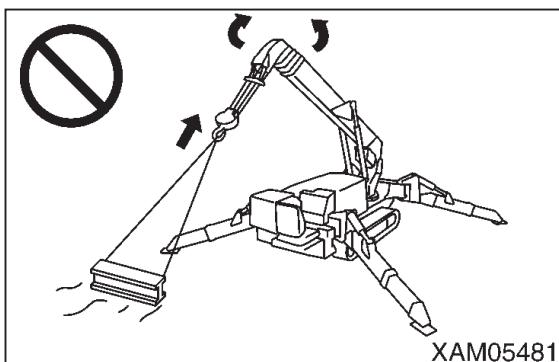
[2] DO NOT OPERATE WITH DERRICKING FORCE

Pull in or lifting the load with boom derricking operation is prohibited.



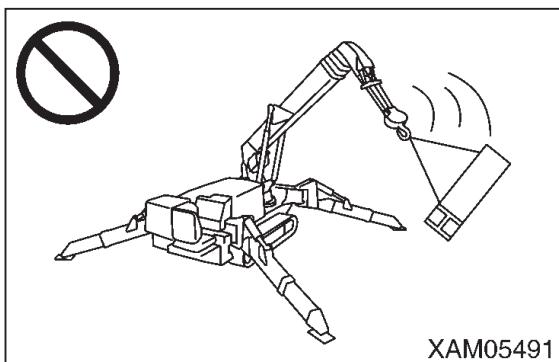
[3] DO NOT PULL SIDEWAYS, PULL IN, AND HOIST DIAGONALLY

Pulling sideways, pull in, or hoisting diagonally applies unreasonable force on the machine. It not only damages the machine body, but also is dangerous. Never operate in these ways. The hook must come right above the centre of gravity of the load hoisted.



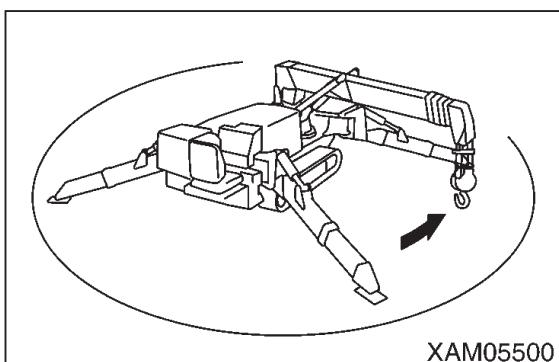
[4] DO NOT OPERATE ROUGH

Do not operate the lever suddenly. Especially, the “slewing”, “boom lowering”, and “hook hoisting down” must be operated at low speed.



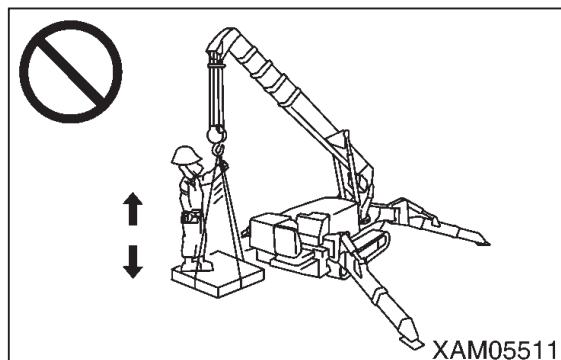
[5] DO NOT ENTER WORKING RADIUS

Do not let people enter the working radius such as permitting an operator to go under the hoisted load.



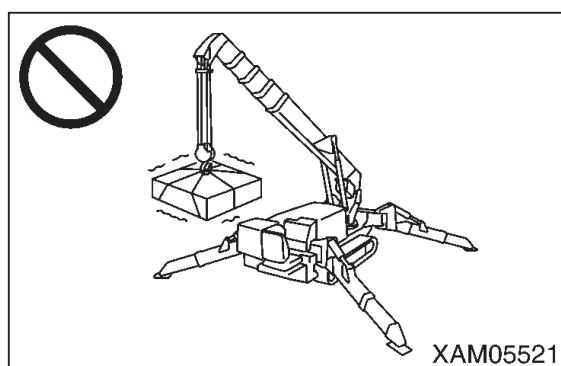
[6] DO NOT USE FOR OTHER THAN MAIN APPLICATIONS

Do not move people up/down with the crane.



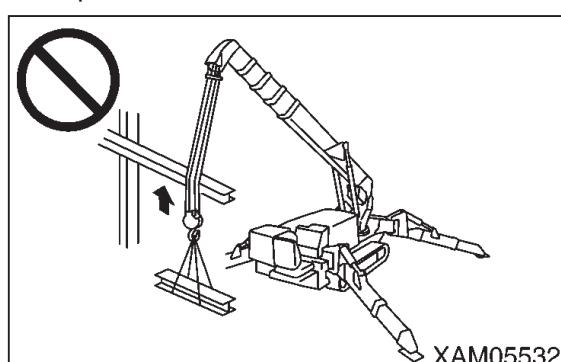
[7] DO NOT PERFORM EXCESSIVE OPERATIONS

Operations requiring more than the machine performance can cause accidents. Particularly, the crane operations must be carried out according to the rated total load chart.



[8] DO NOT WIND BY FORCE

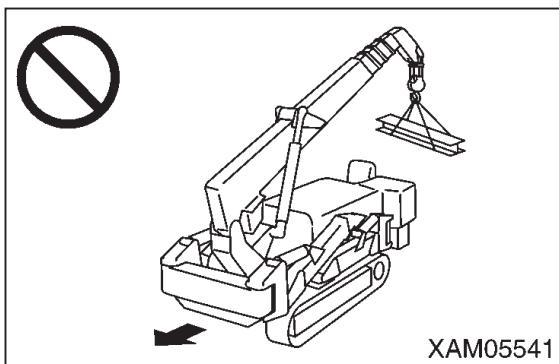
Be careful not to hook the wire rope over a tree or steel beam while working. If it gets stuck with something, do not force to wind the wire rope. Untangle and then wind the wire rope.



[9] DO NOT OPERATE DURING PICK & CARRY

The load may sway or the machine may overturn during Pick & Carry.

Do not perform slewing operation or crane operations.



5.2.26 PICK & CARRY OPERATION

5.2.26.1 CAUTIONS DURING PICK & CARRY OPERATION

⚠ DANGER

Pick & Carry makes the machine very unstable and involves danger, and is principally prohibited.

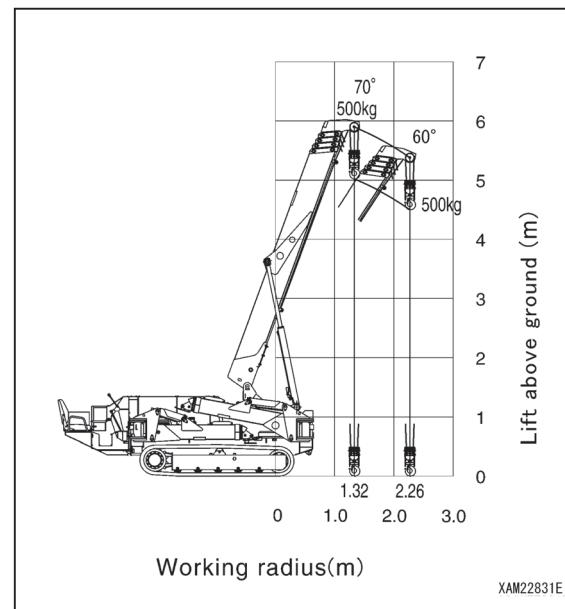
If you have to perform Pick & Carry by necessity, the load must be within the values shown in the "Pick & Carry rated total load chart" and Pick & Carry posture must be strictly respected.

Not observing these cautions on Pick & Carry can cause serious accidents.

When using the searcher hook, do not operate pick and carry.

RATED TOTAL LOAD AND WORKING RANGE CAUTION DURING PICK & CARRY

ALWAYS observe the rated total load in the following table and the working range in the figure during Pick & Carry.



Item	Abstract
Boom position	180±5 degrees slewing
Boom length	When most retracted
Boom angle range	60 to 70 deg
Rated total load	Within 500 kg (including 50 kg the hook mass)
Number of falls	4 fall hook block

CAUTIONS ON WORKSITE

The following ground and location present the machine tip-over hazard. Do not approach those locations or perform Pick & Carry at those locations.

Check the condition of the road surface and ground in advance and place someone to guide you at hazardous locations or locations with poor visibility.

- Slope, soft ground such as swamps, ground with many obstacles, ground with distinct irregularity such as river beds
- Near deep gullies and road shoulders
- Under water, shallow water, snowy area, frozen road

CAUTIONS ON OPERATIONS

The following travelling operations involve the danger of tip-over the machine. Never perform these operations.

Always be seated to the operation seat and carefully perform the Pick & Carry operation.

- Do not perform the crane operation while travelling. Keep Pick & Carry posture.
- Do not hold the load high. Hold the load near the ground so that the load does not slew.
- Do not perform sudden starting, sudden stop, or sudden steering. The load will slew and will be dangerous. Keep the engine at low speed and travel slowly.
- Do not go over an obstacle. The machine will tip-over easily. Always travel on the path avoiding the obstacles.

5.2.26.2 PICK & CARRY POSTURE

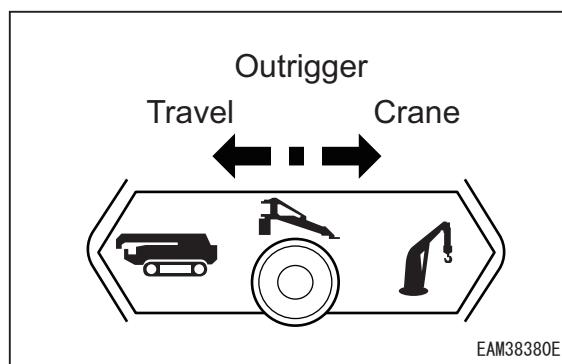
[1] CHANGE TO PICK & CARRY POSTURE FROM TRAVELLING POSTURE

⚠ DANGER

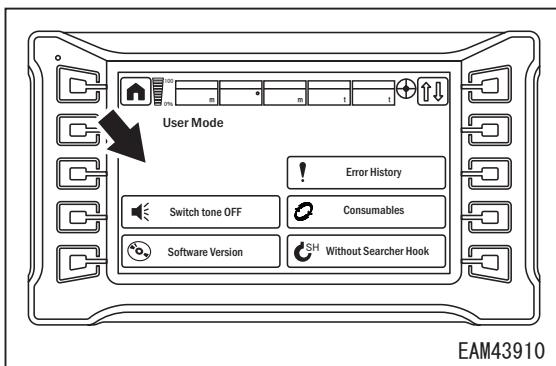
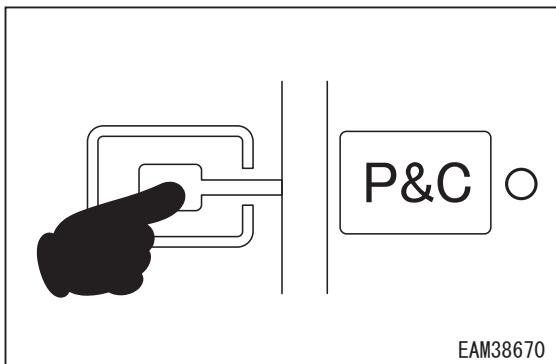
When changing machine from travelling posture to Pick & Carry posture, be sure to carry it out on level and firm ground. Otherwise, it may cause tipping of the machine.

Be sure to set the travel lock lever to the “lock” position when not in the Pick & Carry posture. If the travel lock lever is not set to the “lock” position, travel operations can be performed. This may lead to serious accidents.

1. Operate the work selector switch (travel/ outrigger/crane) on the outrigger operation panel to the “Travel” position.



2. Push the Pick & Carry switch on the monitor to change to Pick & Carry mode.



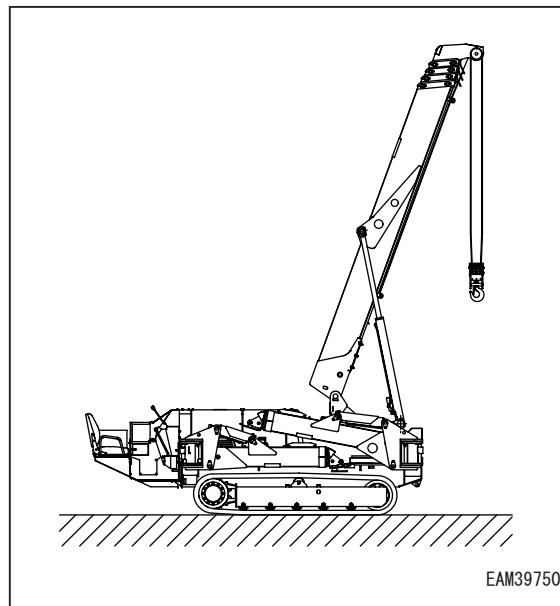
- ☞ You cannot switch to Pick & Carry mode if the number of falls is not 4. Please change the number of falls. In addition, the icon are hidden and the number of falls cannot be changed during Pick & Carry mode.

3. Hoist down the hook block until the overwind detector is not activated.

4. Raise the boom to 60 to 70 degrees.

- ☞ A warning alarm buzzer sounds when the machine is inclined 3° or more. In such case, place the machine on level and firm ground and try it again.
- ☞ Message "Speed is restricted to ensure safety. Boom operation may stop if a dangerous condition is detected." will be displayed when the boom is boom slewing stowage position.

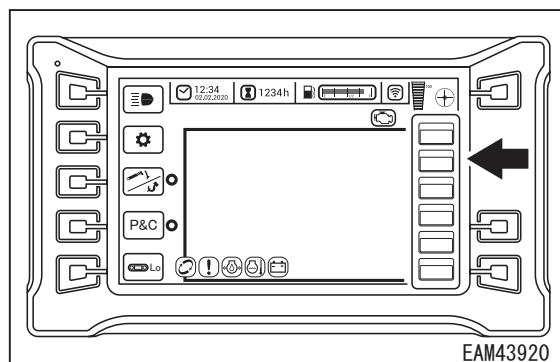
5. Slew the boom to 180±5 degrees.



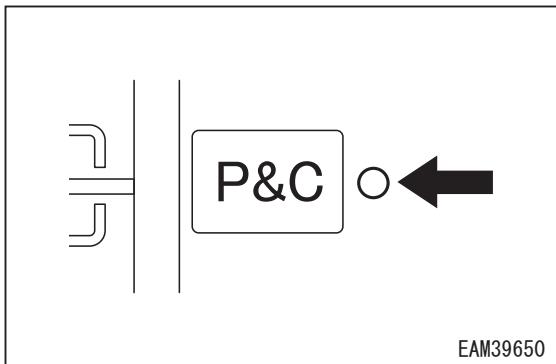
- ☞ Slewing operation is possible only when the boom is fully retracted, boom angle is 60 to 70 degrees and there is no load lifted.
- ☞ While slewing, other crane functions cannot be operated.
- ☞ When the slewing position is out of 180±5 degrees, the message "When not in Pick & Carry posture, always set the travelling lock lever to the "Lock" position." is displayed.

6. During Pick & Carry mode, slewing operation may be restricted. In this situation, the corresponding moment limiter display icons will flash.

- Boom length display flashes: Boom is not fully retracted.
- Boom angle display flashes: Boom angle is outside the 60 to 70 degrees range.
- Actual load display flashes: Actual load is not no load.



7. When the Pick & Carry posture lamp lights in yellow, Pick & Carry can be operated. If this is not lit, check the machine conditions listed below.

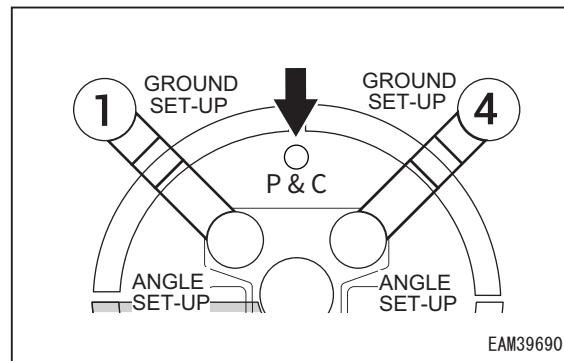


- ☞ Lighting condition of the Pick & Carry posture lamp (lights up when all conditions are met)
 - Boom is fully retracted
 - Boom angle is 60 to 70 degrees
 - Slew boom to 180±5 degrees
 - No load lifted

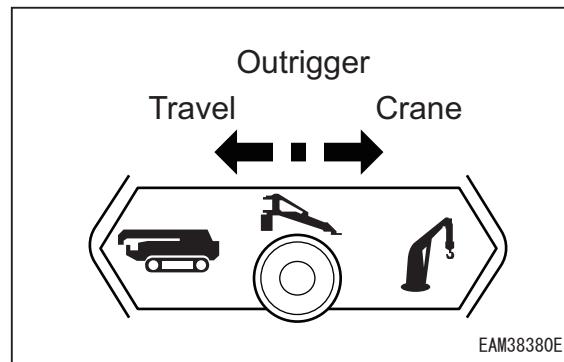
[2] CHANGE TO PICK & CARRY POSTURE FROM CRANE MODE POSTURE

1. If the machine is hoisting a load, unload and make no-load condition.
2. Set the crane to the below conditions
 - Boom is fully retracted
 - Boom angle is 60 to 70 degrees
 - Slew boom to within 180±5 degrees

- No load lifted
 - ☞ If all the above conditions are met, the Pick & Carry posture lamp lights in yellow and outriggers can be operated. If it is not lit in yellow, outrigger cannot be operated, so check the machine condition.



3. Operate the work selector switch (travel/outrigger/crane) on the outrigger operation panel to the "Outrigger" position.



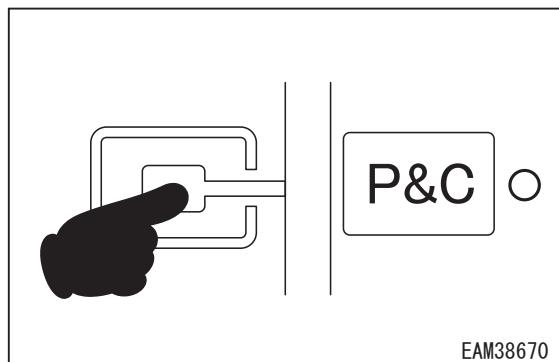
4. Refer to "5.2.24 OUTRIGGER STOWING OPERATION" and stow the outriggers.
 - ☞ Pick & carry is possible even though the outriggers are not completely stowed. However, it is recommended to have outriggers completely stowed for Pick & Carry operation.
 - ☞ A warning alarm buzzer sounds when the machine is inclined 3° or more and stops when the machine is placed in a horizontal position.

5.2.26.3 PICK & CARRY OPERATIONS

⚠ DANGER

- **Read the items described in “5.2.26.1 CAUTIONS DURING PICK & CARRY OPERATION” when performing Pick & Carry for safe operation.**
- **Read “5.2.26.2 PICK & CARRY POSTURE” when preparing for the Pick & Carry posture. Make sure to follow the process.**
- **Do not perform crane operations during Pick & Carry. The machine may tip-over.**
- **Always remain seated in the operator's seat and carefully perform the Pick & Carry operation.**
- **Verify that it is safe around the machine and sound the horn before starting to move the machine.**
- **Verify that it is safe around the machine and sound the horn before switching between travelling forward/backward or steering.**
- **Keep the engine speed at low speed during travelling and travel slowly and carefully. Keep a safe distance so that the hoisted load or machine does not hit other machines or structures.**
When the machine tilts forward/backward/left/right during the crane operation and travelling, the warning alarm buzzer sounds.
- **When the warning alarm buzzer sounds, stop the work immediately. The machine may tip-over. Strictly observe the values in the “Rated total load” during the crane operation. Avoid slopes and obstacles while travelling.**
- **A warning alarm buzzer sounds when the machine is inclined 3° or more and stops when the machine is placed in a horizontal position.**

1. To perform crane operation, confirm that the mode is set to Pick & Carry mode with the letters on the Pick & Carry switch lit up yellow on the monitor.
Perform crane operation with this state.
For crane operation, see “5.2.18 HOOK HOISTING UP/DOWN OPERATION” and “5.2.19 BOOM DERRICKING OPERATION.”
Keep the hoisted load near the ground so that the load will not sway.



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2. For travel operation, see
 - “5.2.6 TRAVELLING MACHINE”,
 - “5.2.8 DIRECTIONAL CONTROLS” and
 - “5.2.9 STOPPING/PARKING MACHINE.”
- When the moment limiter is activated, the alarm buzzer sounds and hazardous boom and winch operations stop automatically.
- If the moment limiter is activated, see the items in “4.1.9.3 [2] RECOVERY OPERATION AFTER AUTO STOP.”
- In Pick & Carry mode, travel speed cannot be set to “Hi”.

2. For travel operation, see
 - “5.2.6 TRAVELLING MACHINE”,
 - “5.2.8 DIRECTIONAL CONTROLS” and
 - “5.2.9 STOPPING/PARKING MACHINE.”
- When the moment limiter is activated, the alarm buzzer sounds and hazardous boom and winch operations stop automatically.
- If the moment limiter is activated, see the items in “4.1.9.3 [2] RECOVERY OPERATION AFTER AUTO STOP.”
- In Pick & Carry mode, travel speed cannot be set to “Hi”.

2. For travel operation, see
 - “5.2.6 TRAVELLING MACHINE”,
 - “5.2.8 DIRECTIONAL CONTROLS” and
 - “5.2.9 STOPPING/PARKING MACHINE.”
- In travel mode, the Pick & Carry posture lamp may turn on and off depending on the weight of the load, but this is not a fault.
- If travel cannot be operated, check if the machine is in Pick & Carry posture or in overload condition.

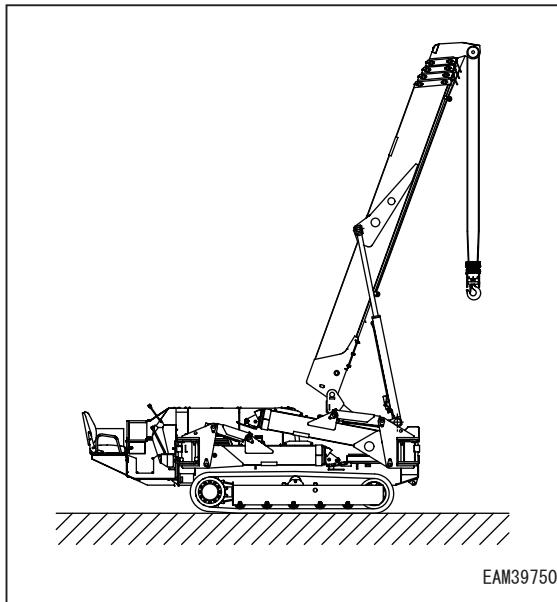
5.2.26.4 CANCELING PICK & CARRY POSTURE

IMPORTANT

This process is for after the Pick & Carry operation. If the mode is not in Pick & Carry, change the mode to Pick & Carry first.

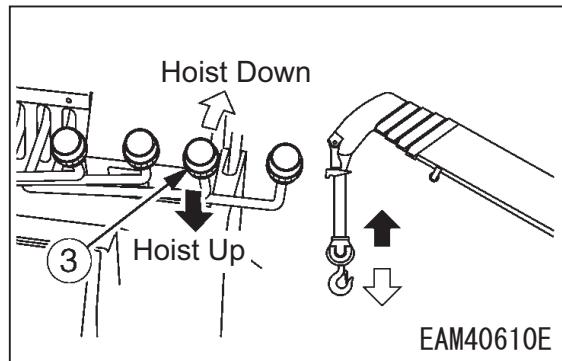
[1] HOW TO RETURN TO TRAVELLING POSTURE

1. If a load is lifted, put it on the ground and make the crane into no-load condition.
2. Set the crane to the below conditions.
 - Boom is fully retracted.
 - Boom angle is 60 to 70 degrees.
 - No load lifted



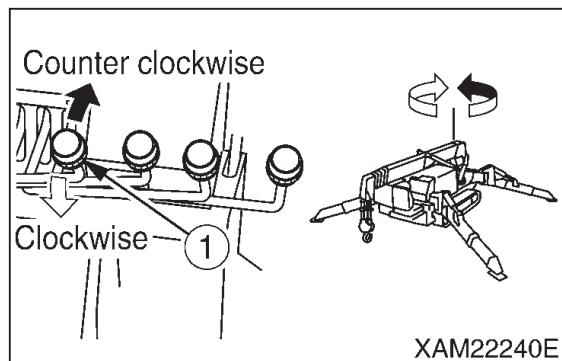
☞ If above conditions are not met, slewing operation is not possible other than the 180 ± 5 degrees area.

3. Hoist up the hook block with winch lever (3) until hook block automatically stops. (overwind condition)

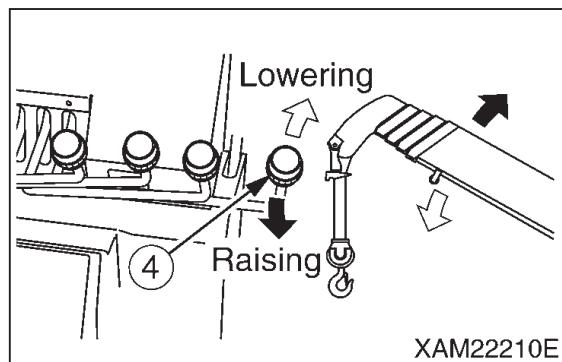


☞ Hoisting the hook block too much will result in the detection of overwinding. Then the alarm buzzer is heard and the hook hoisting up operation automatically stops.

4. Use the slewing lever (1) to slew the boom clockwise or counter clockwise to a boom angle of 1 to 2 degrees.



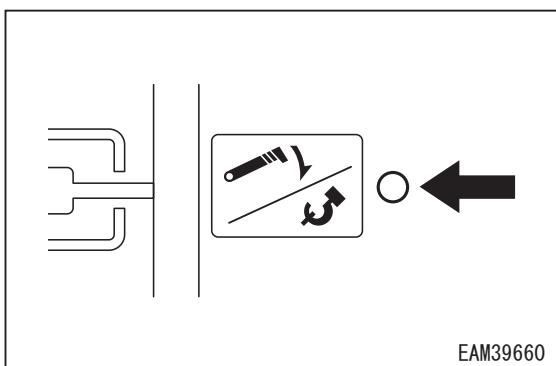
5. Operate the boom derricking lever (4) to the "LOWER" (push forward) side and lower the boom until it automatically stops.



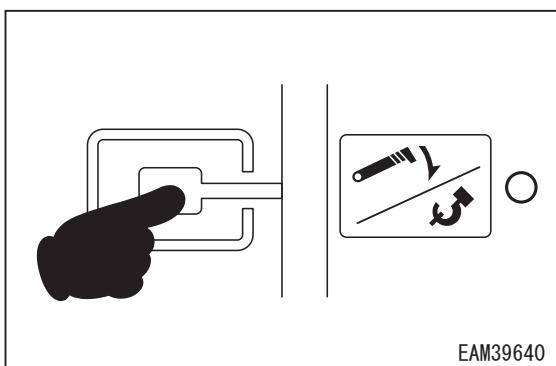
6. The boom stowage position lamp lights up in yellow when the boom is in the boom stowage position.
If it is not lit up, check the conditions.
Stow the hook by pressing the hook stowage switch on the monitor.

☞ Conditions for lighting up the boom stowage position lamp (light up when all are met)

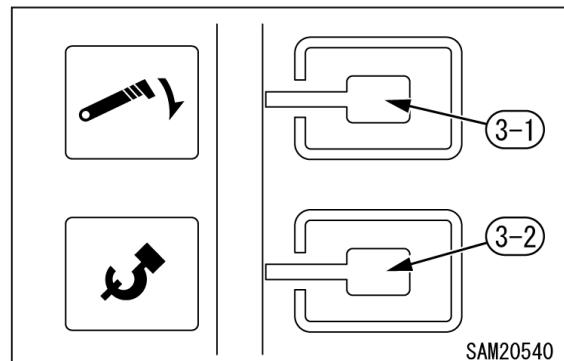
- Boom is fully retracted
- Slewing position is 0 to 6 degrees
- No load lifted



7. Push the hook stowage/boom stowage switch on the travel screen.

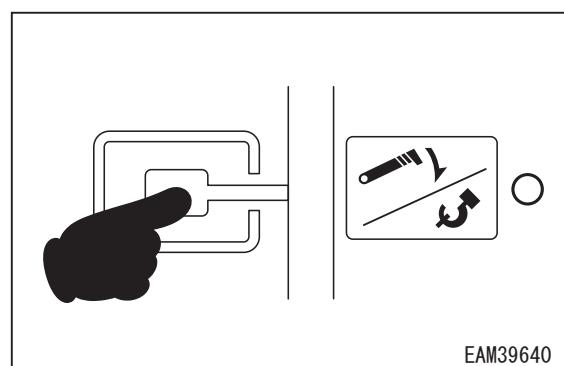


8. With the boom stowage switch (3-1) on the monitor depressed, operate the boom derrick lever (4) to the "LOWER" (push forward) side to stow the boom in its fully lowered state.

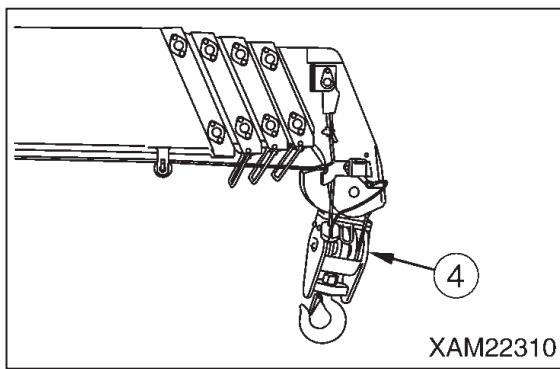
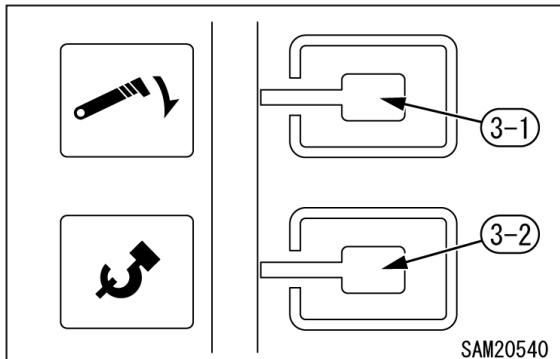


☞ The boom is stowed only while the switch is depressed.

9. Push the hook stowage/boom stowage switch on the travel screen.

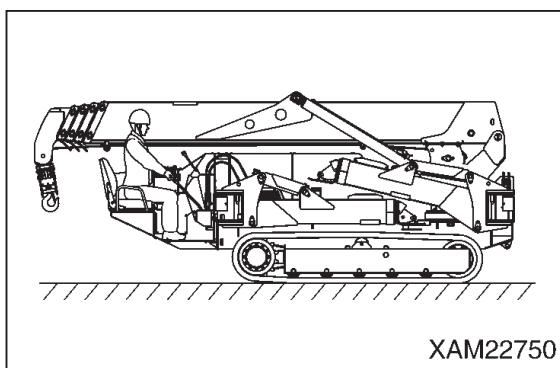


10. With the hook stowage switch (3-2) on the monitor depressed, operate the winch lever (3) to the "UP" (pull toward you) side to stow the hook at the bottom of the boom end.

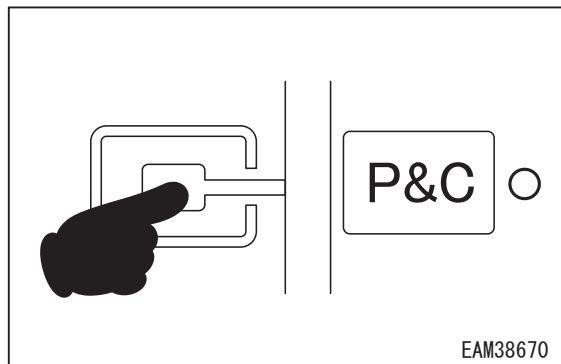


☞ The hook is stowed only while the switch is depressed.

11. Check the machine is in the travelling posture.



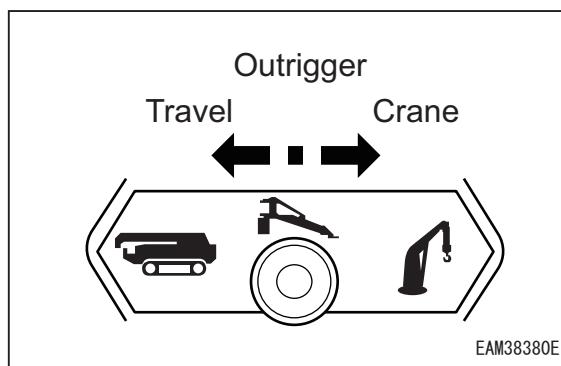
12. Turn off the Pick & Carry switch on the monitor to change to normal Travel mode.



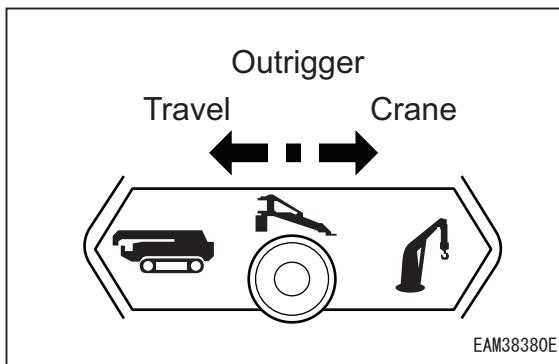
☞ You can only press the Pick & Carry switch to turn Pick & Carry mode OFF when the machine is in travelling posture. If it does not switch to normal travelling mode, check the machine's posture.

5.2.26.5 HOW TO RETURN TO CRANE OPERATION POSTURE

1. If a load is suspended, unload the load, and make the crane into no-load condition.
2. Set the crane to below conditions.
 - Boom is fully retracted.
 - Boom angle is 60 to 70 degrees.
 - Slewing angle is within 180 ± 5 degrees
 - No load lifted
 ☞ If above conditions are met and the Pick & Carry posture lamp lights up, the outriggers can be operated.
3. Operate the work selector switch (travel/outrigger/crane) on the outrigger operation panel to the "Outrigger" position.



4. See "5.2.13 OUTRIGGER SETTING" and set the outriggers.
5. Operate the work selector switch (travel/outrigger/crane) on the outrigger operation panel to the "Crane" position.



- ☞ When the mode is switched to either outrigger mode or crane mode using the work mode switch, Pick & Carry mode will automatically turn OFF if the following conditions are not met.
 - When the Pick & Carry posture display is light.
 - When the machine is in travel posture.

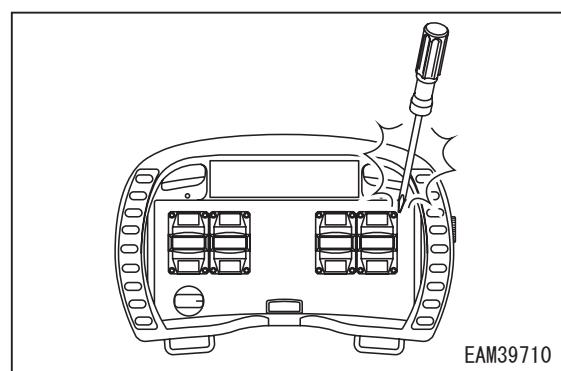
5.3 REMOTE CONTROL SYSTEM

5.3.1 BASIC PRECAUTIONS

5.3.1.1 RADIO REMOTE CONTROL DEVICE HANDLING PRECAUTIONS

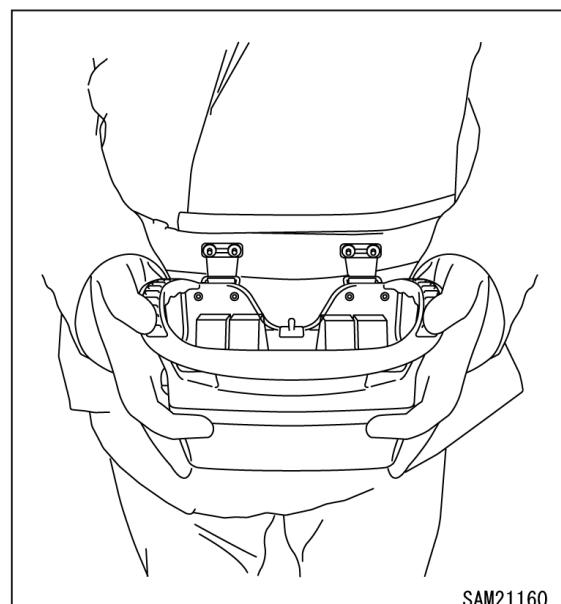
DO NOT MODIFY

Never attempt to disassemble or modify the transmitter, receiver, or accessories. Doing so may cause electric shock or fire.



CARRYING THE TRANSMITTER

- Operate the transmitter as described below. Attach the waist belt and operate the control levers and buttons with your thumbs. Use your fingers to hold the grips of the transmitter.



- Be sure to operate the transmitter control levers and switches with your fingers. Do not attempt to poke them with sharp objects. This may create holes in the transmitter, allowing the ingress of water, which in turn can cause failures, malfunctions, or serious accidents.

NEVER WASH WITH WATER

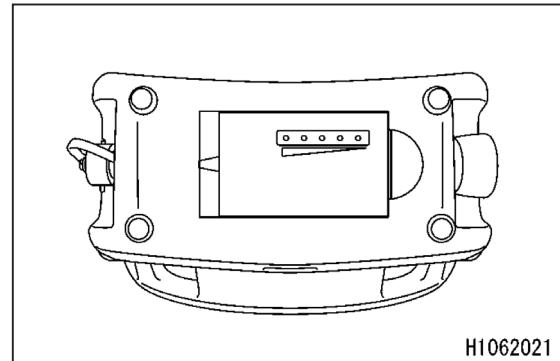
- Always maintain the transmitter in clean condition. If oil or dirt is allowed to build up, there is a risk of your hands slipping, causing unintended operations or serious accidents.
- Never wash the transmitter or receiver with water or high-pressure water jets. Doing so may allow the ingress of water, causing failure or malfunctions and resulting in electric shock or serious accidents.
- Clean the transmitter and receiver by wiping off any dirt using a cloth moistened with water or diluted detergent. Avoid using alkaline cleaners, alcohol, or cleaning sprays. Such substances may cause the plastic to crack.



KEEP OBJECTS AND WATER FROM ENTERING THE DEVICE

Do not insert metal objects, combustible materials, or water into the transmitter battery compartment or openings in the battery charger.

Likewise, do not connect terminals inside the transmitter battery compartment or the battery charger by inserting metal objects through the opening thereof. Doing so may cause electric shock or fire.



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DO NOT SUBJECT TRANSMITTER TO IMPACT

- When using the transmitter, be sure to use the waist belt to prevent it from being dropped while in use. Fasten the waist belt securely until it clicks.
- Do not subject the transmitter to impact (for example, by hitting it with other objects). Doing so may damage the casing or internal components, causing failure or malfunctions and resulting in electric shock or serious accidents.
- If the transmitter becomes damaged, remove the battery from inside the transmitter, then contact us or our sales service agency for repairs. Continuing to use the transmitter in a damaged state may cause malfunctions and result in electric shock or serious accidents.



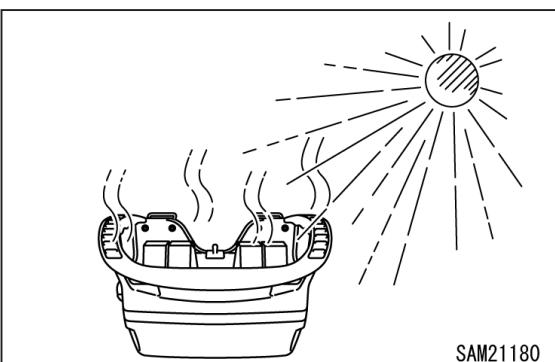
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HANDLING PRECAUTIONS IN COLD CONDITIONS

- Do not use the transmitter in locations subject to sudden ambient temperature fluctuations, in extremely cold locations (below -20 °C), or in locations directly exposed to cold draughts. Sudden temperature fluctuations may cause condensation to occur inside the transmitter, causing failure or malfunctions and resulting in serious accidents.

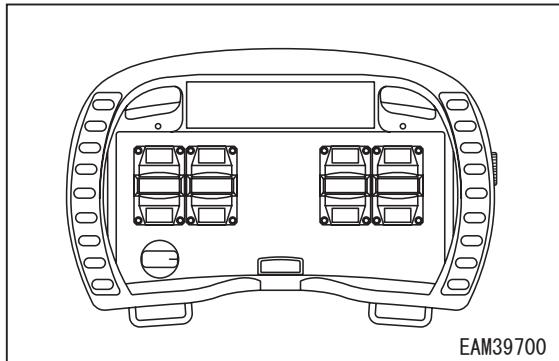


- Be sure to allow the crane to fully warm up before operating it in cold conditions. Cold conditions will reduce the hydraulic oil temperature, making it more viscous, and possibly resulting in the delayed response of hydraulic equipment when operating the crane.
- Avoid storing the transmitter in the following locations. These locations may cause the transmitter casing to become deformed or discoloured, causing failure or malfunctions and resulting in serious accidents.
 - Extremely cold locations or locations directly exposed to cold draughts
 - Locations exposed to direct sunlight
 - Locations facing the vehicle exhaust
 - Locations close to heaters
 - Humid locations



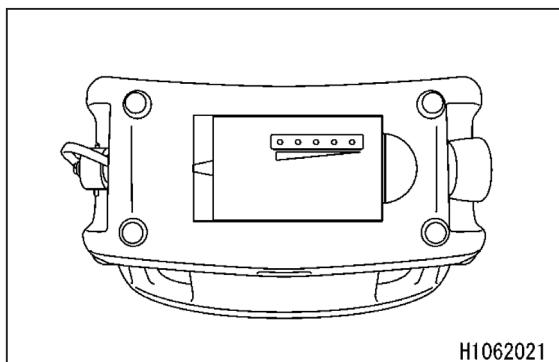
RADIO REMOTE CONTROL DEVICE OPERATING ENVIRONMENT PRECAUTIONS

The R/C device must not be used in locations where there is a danger of explosion.

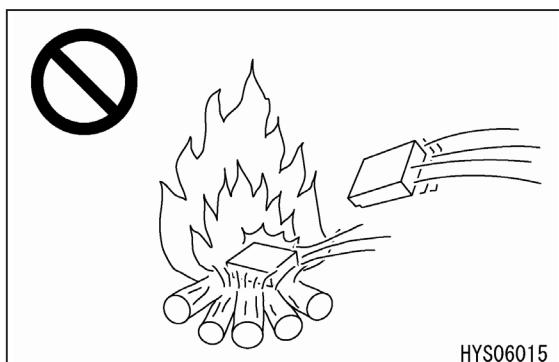


Battery

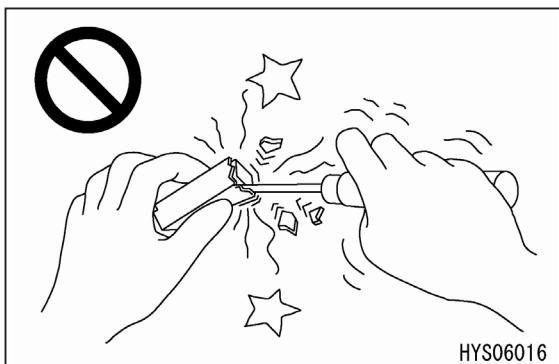
- Use a specified battery for the remote control system. The use of battery other than specified may cause electrolyte leakage, heat generation and rupture of the battery.
- When setting a battery in the transmitter of the remote control system, be careful not to turn the battery upside down. Doing so may cause a failure of the inside devices of the transmitter, and electrolyte leakage, heat generation and rupture of the battery.



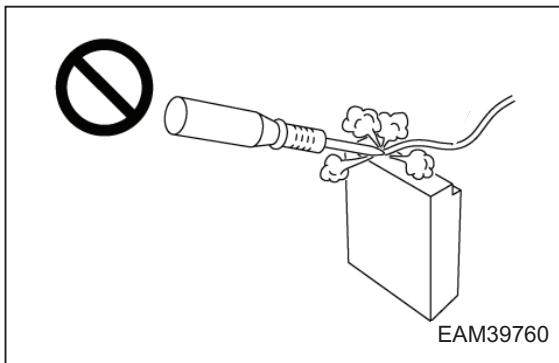
- Do not heat the battery or put it in fire. Doing so may cause electrolyte leakage and rupture of the battery.



- Do not disassemble or modify the battery. Doing so may cause electrolyte leakage, heat generation and rupture of the battery.



- Do not solder directly to the battery. Doing so may cause electrolyte leakage, heat generation and rupture of the battery.



- If leaked electrolyte contacts your eyes, immediately wash it away with plenty of water and promptly see a doctor. Periodically charge and discharge the battery within six months.

TEMPORARY STORAGE WHEN ABNORMALITY IS FOUND

In case the remote control system is found with an abnormality and is therefore stored temporarily waiting for service, apply following measures to notify all persons in the office that "the use is prohibited due to failure."

1. Put up a sign showing "Use Prohibited". Write clearly the information such as abnormality contents, name and contact of the storage manager, and the term of storage.
2. Take out the battery.
3. Never perform operation using a failed remote control system.

CAUTIONS DURING WELDING REPAIR

When performing welding repairs to the crane, weld in a location with good facility, and, only authorised personnel are permitted to weld.

- Disconnect the battery terminals to prevent battery explosions.
- Disconnect the electric wiring connection section with the receiver. Otherwise, the electric system of the receiver will be destroyed.

5.3.1.2 OPERATION PRECAUTIONS

⚠ WARNING

This section describes only the precautions specific to R/C operation. Also be sure to check the general machine precautions before performing individual operations. For details on general machine precautions, refer to "Chapter 2 SAFETY."

5.3.1.3 BEFORE STARTING ENGINE

PRE-START INSPECTION

Before operation, perform the pre-start inspection as specified for this machine. Serious injury or death can occur if these inspections are neglected. Any failure detected during inspection must be corrected immediately.

ENGINE STARTING

- Ensure the area is clear of people and obstacles before starting the engine.
- Sound the horn as a warning before turning the ignition key.

BEFORE TURNING ON TRANSMITTER

- Check for dirt, cracks in the enclosure and damaged display, control levers or operation switches. **WARNING!** Unsafe Operation Hazard. Do not use the transmitter if the enclosure is cracked or the display, control levers or operation buttons are damaged. The transmitter must be clean and in good operating condition while operating the machine.
- Ensure that the transmitter's control levers and operation switches move smoothly and properly.

AFTER TURNING ON TRANSMITTER

Ensure the display of the transmitter displays the correct indications.

Switch to each operation mode (CRANE and OUTRIGGER), then check the display for the proper indications when each lever and button is manipulated. In addition, verify each applicable load value on the transmitter is identical to that on the moment limiter display.

5.3.1.4 AFTER STARTING ENGINE**FUNCTION CHECK OUTRIGGER MODE USING TRANSMITTER**

- Switch the transmitter mode selector switch to "OUTRIGGER LIFTING AND GROUNDING" or "OUTRIGGER EXTENSION." Confirm that the display also switches to the outrigger display.
- Operate the levers and check the outrigger extend and retract operations.
- Operate the levers gradually. Abrupt movement of the levers may cause the crane to overturn.
- Ensure the position pins of the outriggers and retainers are securely fixed.

FUNCTION CHECK CRANE MODE USING TRANSMITTER

- Before switching operation mode to CRANE, extend all the outriggers and ensure they are securely positioned on the ground.

- Switch the transmitter mode selector switch to "CRANE." Confirm that the display also switches to the crane display.
- Check to confirm that the Emergency stop Switch (EMO) functions before starting. The Emergency stop Switch (EMO) shuts down the engine for the main unit and shuts off power to the transmitter unit. If you press the switch and the machine does not stop, stop use immediately. Contact us or our sales service agency.
- Activate levers for crane operation and ensure crane functions correctly. See "3.4 RATED TOTAL LOAD CHARTS." for proper loading of crane.
- Always operate the levers on the transmitter slowly when hoisting a load.

SIMULTANEOUS OPERATION PROHIBITED

Do not operate the crane from both the R/C device and the machine itself at the same time. To ensure safety, the crane is configured so that it cannot be operated from the machine itself when the R/C device is being used, as there is a risk of serious accidents due to unintended crane operations.

CONFIRMATION OF OPERATION SWITCH SELECTION

Before operating, be sure to confirm that the operation switch is set to the operation mode to be performed. There is a risk of serious accidents such as crane toppling or collision due to unintended operations if the operation switch is not correctly set.

OPERATION IN EMERGENCIES

In the event of an emergency or if even a minor obstruction is present within the machine operating area, immediately press the emergency stop switch to shut down the transmitter.

PAY ATTENTION TO FUEL LEVEL

Even when operating using the R/C device, frequently check the remaining fuel level, and take care not to allow the fuel to become fully depleted.

5.3.1.5 TERMINATING OPERATION**CAUTION WHEN ENDING OPERATION**

- The monitor must be used when stowing the crane, so turn off the transmitter and operate from the machine itself.
- When stowing the outriggers, switch the transmitter mode selector switch to "OUTRIGGER LIFTING AND GROUNDING" or "OUTRIGGER EXTENSION." Confirm that the display also switches to the outrigger display.
- After crane operation, always turn off power to the transmitter.
- Do not turn transmitter on unless crane is in operation. **WARNING!** Sudden Movement Hazard. Never turn on the transmitter until the crane is properly positioned and ready for operation. Unexpected contact with the operation levers or buttons may cause unexpected movement of the crane.

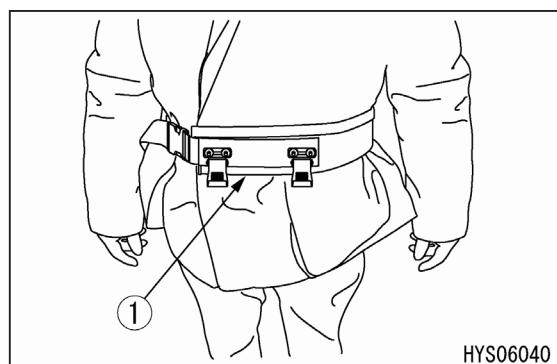
5.3.2 REMOTE CONTROL SYSTEM OPERATION**⚠ WARNING**

- Do not disassemble or modify the transmitter or receiver. Damage to the components may result in electrical failure.
- Do not use sharp objects or tools to operate the transmitter. A sharp object or tool may damage the transmitter, allowing water to enter it and resulting in internal component damage and/or electrical failure.
- Always keep the transmitter clean and free of oil and mud. A slippery or dirty transmitter may cause an operator error.

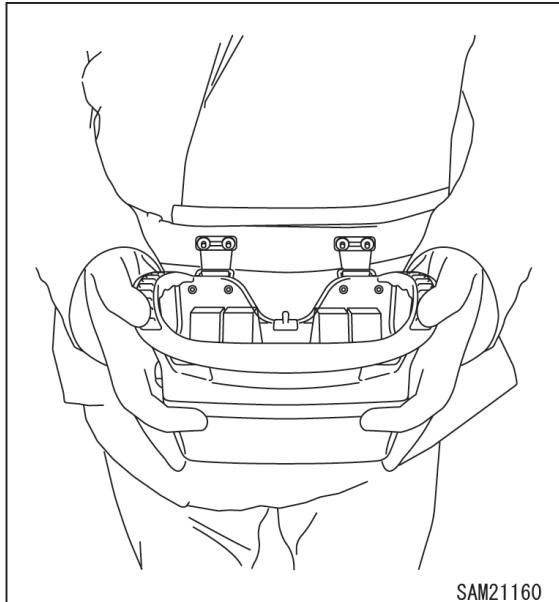
- Do not allow water to enter the transmitter. Only use a damp cloth with detergent to clean the transmitter. Damage to the transmitter may result if water is allowed to enter it, resulting in internal component damage and/or electrical failure.
- Do not use the transmitter if its case is damaged. Do not drop the transmitter or allow the case to become damaged. A damaged case may cause internal component damage and/or electrical failure.
- Do not use the transmitter if its case is damaged. A damaged transmitter case may cause operator error.
- Do not use both the remote control and manual controls to operate the crane at the same time. Only one method of control must be used at a time to operate the crane.

Before operating the remote control system, verify proper operation of the transmitter and receiver. See "6.13 REMOTE CONTROL SYSTEM INSPECTIONS."

1. To avoid dropping the transmitter, wear the waist belt (1) around your waist and attach the transmitter to the waist belt (1).



2. After powering on the transmitter, before operating the crane, be sure to give an alarm sound (horn) to alert people at the worksite.



- ☞ If the battery for the transmitter runs low, recharge the battery or replace the battery with a charged battery.
- ☞ In the case of the remote control system, radio waves may not be received even at close range due to jamming or depending on reflection conditions in the vicinity.
- ☞ Operate as close to the Receiver antenna as possible.
- ☞ In crane operation, when the transmitter has not been operated for a certain period of time after the last operation, it will be automatically turned "OFF". When using the transmitter again, first turn on the transmitter power.

5.3.2.1 POWERING ON

⚠ CAUTION

- If the remote control system does not power on, check the remote control system for the following:
 - Is the battery charged fully?
 - Is the emergency stop (EMO)/remote control power OFF switch pressed?

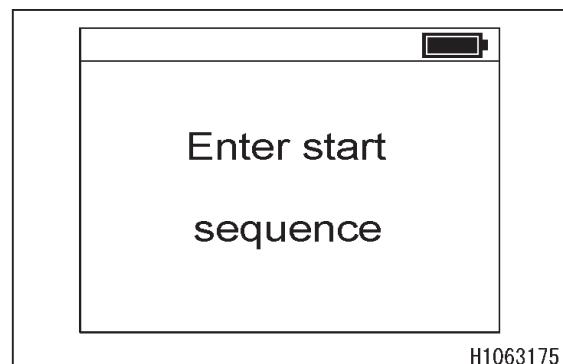
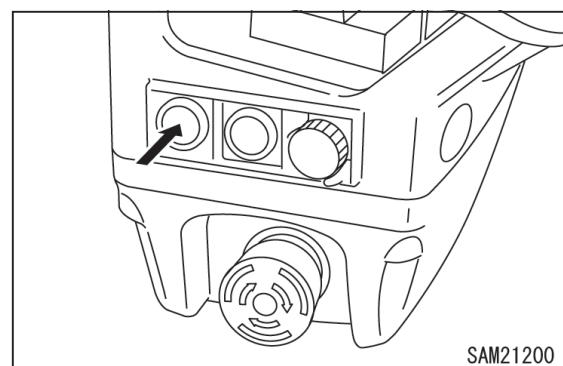
- You must press the Transmitter Power Switch a total of three times to enable crane operations using the remote control system.

IMPORTANT

When either of the following occurs in standby mode, power will shut off:

- Any switch other than the Transmitter Power Switch is pressed
- No action is performed for a certain period

1. Press the power switch on the transmitter and verify that the battery symbol at the top left of the left-hand display flashes in green. The remote control system is in standby mode once "Enter start sequence" appears on the right-hand display.



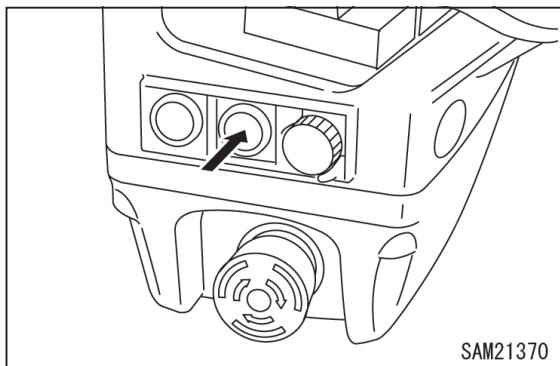
2. Press the Transmitter Power Switch in standby mode. The remote control system power will turn on once the display changes.

- To enable crane operations, press the Transmitter Power Switch once again with power to the remote control system turned on.

5.3.2.2 STARTING/STOPPING THE ENGINE

[1] START THE ENGINE

- Turn on power to the transmitter. See "5.3.2.1 POWERING ON."
- Pressing the Engine Start/Stop Switch when the engine is stopped will allow the engine to start.



[2] STOPPING THE ENGINE

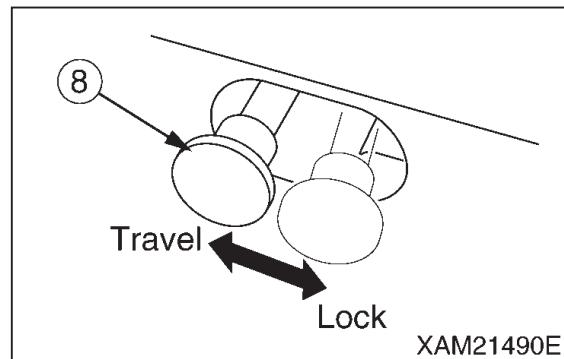
Pressing the Engine Start/Stop Switch when the engine is running will allow the engine to stop.

- To stop the engine, press and hold the Engine Start/Stop Switch until it stops.

5.3.2.3 OPERATION AFTER ENGINE IS STARTED

[1] OPERATION BEFORE WORK

Push down the travelling lock levers (8) to the "LOCK" position to enable operation of the outriggers and crane.



5.3.2.4 OUTRIGGER OPERATION

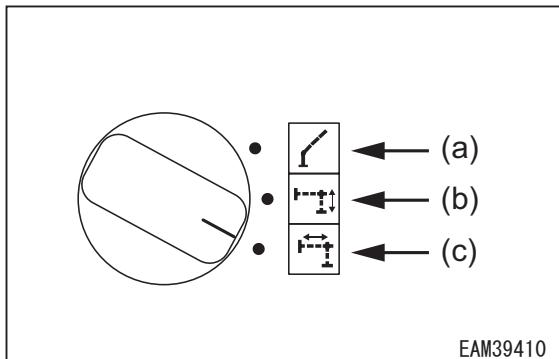
[1] OUTRIGGER SETTING PROCEDURE

⚠ WARNING

- There are four outriggers. Be careful to operate the four individual outrigger switches correctly. Check the position on the "number plate" affixed to each outrigger against the number indicated on the "operation plate" on the switch unit. Operating the wrong outrigger may result in serious accidents.
- Set the engine speed to low speed when operating the outrigger switches. If the engine speed is set to high speed, the outriggers may operate suddenly, resulting in machine toppling or other serious accidents.
- The warning alarm buzzer sounds if the machine tilts for "3 degrees" or more when setting the outriggers. Operate the switches and adjust the machine to be levelled in which state the alarm buzzer will not sound.

- Check the number on the operation label at the levers on the transmitter to determine which outrigger to be operated.

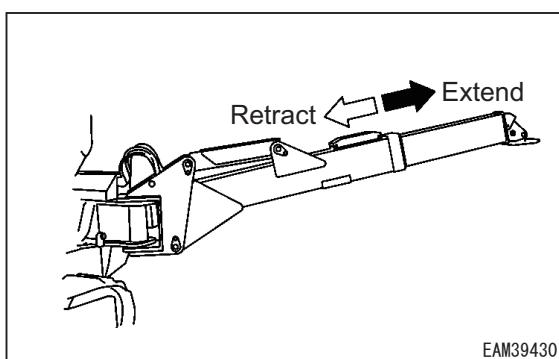
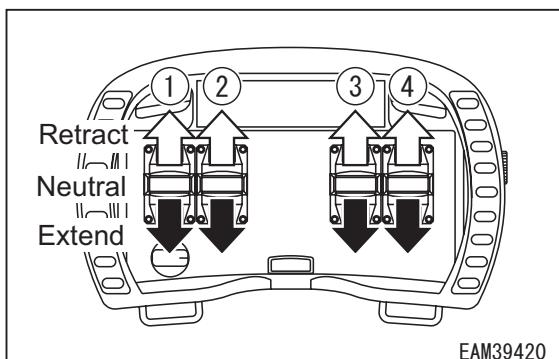
2. Operate the operation mode selector switch to the "Outrigger extension" position(c).



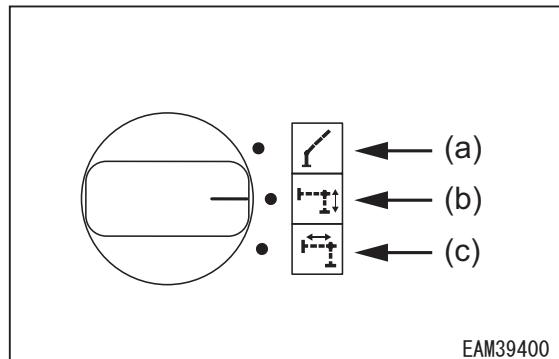
3. Push down an outrigger lever or two of them at the same time to the "Extend" (pull toward you) side.

When the outrigger extension cylinder extends and the inner box extends to the desired position, set the lever to the "Neutral" position.

Operate the remaining levers in the same way and extend the inner box of the four outriggers to the desired position. Set the switch to the "Neutral" position.



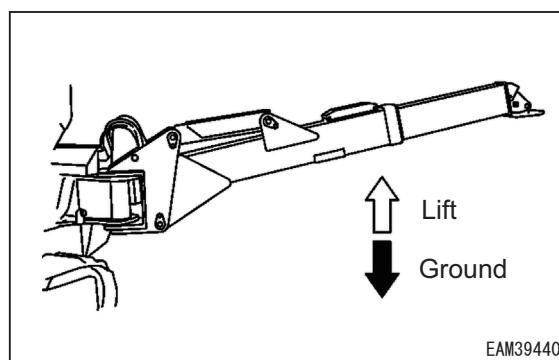
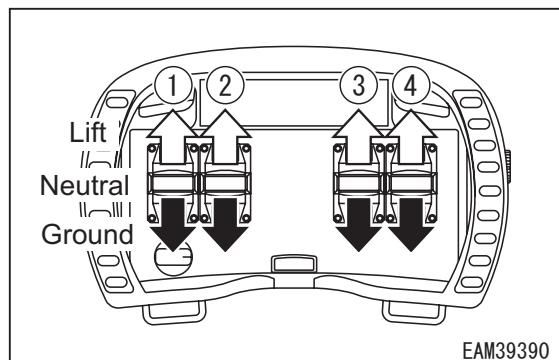
4. Operate the operation mode selector switch to the "Outrigger lifting and grounding" position(b).



5. Push down an outrigger grounding lever or two of them at the same time to the "Ground" (pull toward you) side.

When the grounding cylinder extends and the outrigger foot is set, set the lever to the "Neutral" position.

Operate the remaining levers in the same way and set the foot of all the four outriggers. Set the lever to the "Neutral" position.



⚠ WARNING

- To lift the machine, use the four operation levers to evenly lift each of the four outriggers little by little.

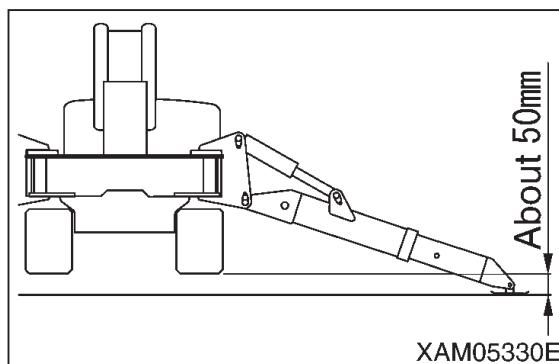
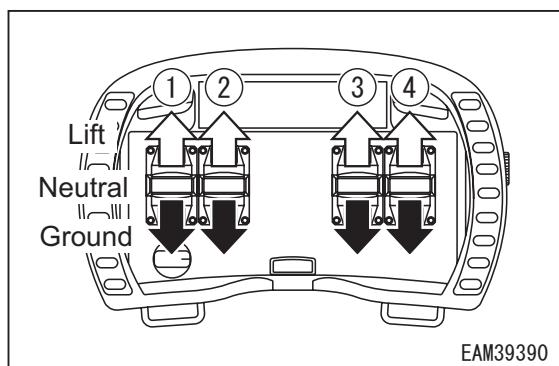
- When operating two operation levers at the same time, choose two front levers (outrigger [1] and [4]) or two rear levers (outrigger [2] and [3]). Operating two left or right levers at the same time will suddenly raise two outriggers on one side, causing tip-over of the machine.
- Do not attempt to extend the outriggers when they are in contact with the ground. This will subject the outriggers to excessive force and possibly damage them.

6. After all the outrigger foots were set, push down an outrigger lever or two of them at the same time to the "Ground" (pull toward you) position.

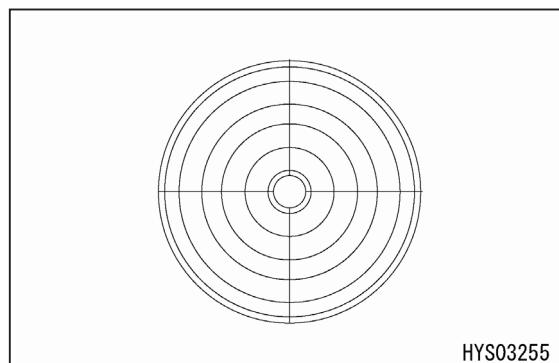
When the grounding cylinder extends and the machine is slightly raised, set the switch to the "Neutral" position.

Operate the remaining levers in the same way so that the four outriggers are raised to the same height. Set the switch to the "Neutral" position.

Repeat this operation to gradually raise the machine until the rubber tracks will be at a height of about 50 mm above the ground.

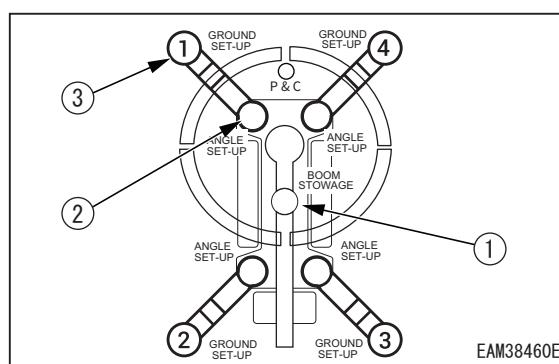


7. When the machine is raised to about 50 mm above the ground, operate the outrigger operation switches while checking the position of the indicator in the level to make the machine level.



8. After setting the outriggers, operate all the outrigger operation switches to the "Neutral" position.

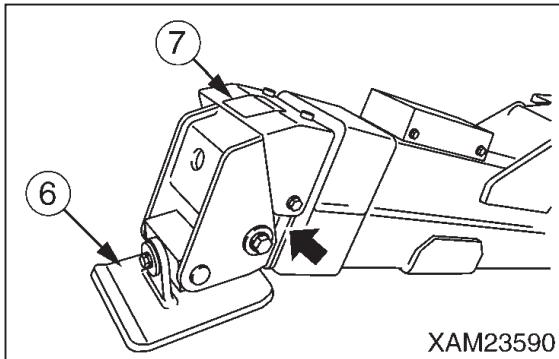
9. Verify that the four outrigger ground set-up lamps (3) (green) on the monitor are ON.



☞ On the outrigger display, all the boom stowage lamp (1), four outrigger extension lamps (2), and four outrigger ground set-up lamps (3) are lit up in green.

⚠ CAUTION

If any of the ground set-up lamps (3) is flashing in red, remove the cover (7) of the outrigger foot (6) and check if there is any foreign object pinched in the bending section.



[2] OUTRIGGER STOWING PROCEDURE

⚠ WARNING

- Do not let people approach toward the machine when stowing the outriggers.
- Staying around the machine may result in serious accidents such as getting caught between an outrigger and the main unit of the machine.
- Verify that there is nothing under the rubber tracks when stowing the outriggers. If there is any object under the rubber tracks, the machine may overturn and serious accidents may occur when stowing the outriggers.
- Stop the engine for operation except for extending/setting the outrigger cylinders. The third person touching an outrigger may result in sudden movement of the outrigger cylinder, which may lead to serious accidents.
- When the position pin is removed, the outrigger loses the support and rotates. Always hold the outrigger with one hand when removing the position pin.

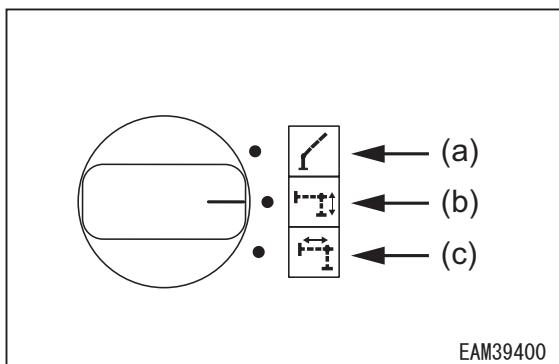
- Do not put your hands or fingers around the gaps of movable areas when stowing the outriggers. Your hands or fingers may get caught, and it may lead to serious accidents.
- Insert the position pin to the end when stowing the outriggers.
- When lowering the raised machine, operate the four operation levers so that the four outriggers are lowered little by little. Suddenly retracting two outriggers just on the right side or left side will cause instability in the machine and it can overturn the machine.
- Do not perform the outrigger extending operation after they are set on the ground. Doing so applies unreasonable force on the outriggers, resulting in the outrigger breakage.
- Always set the travelling lock lever to the “LOCK” position when operating the outriggers.

⚠ CAUTION

- Always keep the boom at the “lowest position and slew and stow position” when operating the outriggers. The outriggers cannot be operated if the boom is not stowed completely. (Verify that the boom stowage lamp (green) on the outrigger display is ON.)
- Operate the operation mode selector switch to the “Outrigger lifting and grounding” or “Outrigger extension” position

1. Check the number on the operation label at the levers on the transmitter to determine which outrigger to be operated.

2. Operate the operation mode selector switch to the "Outrigger lifting and grounding" position(b).

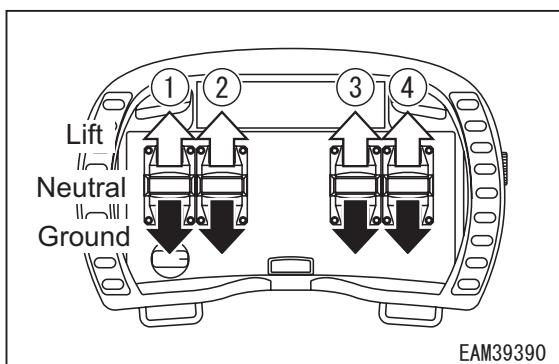


3. Push down an operation lever or two of them at the same time to the "Lift" (push forward) side.

When the outrigger grounding cylinder retracts and the machine starts to go down, return the lever to the "Neutral" position.

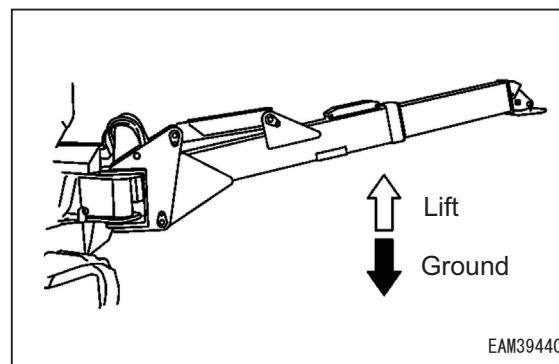
Operate the remaining levers in the same way and lower all the four outriggers to the same height. Return the lever to the "Neutral" position.

Repeat this operation to gradually lower the machine until the rubber tracks are totally ground.

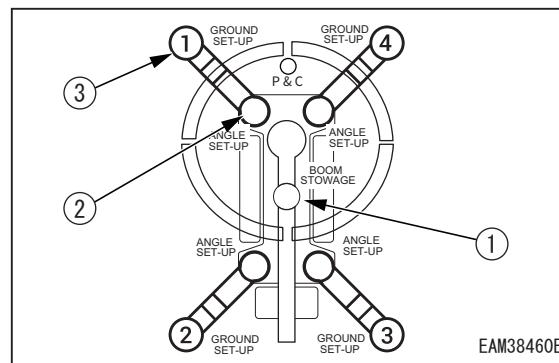


4. When the left and right rubber tracks are completely set on the ground, push down again an operation lever or two of them at the same time to the "Lift" (push forward) side.

When the grounding cylinder completely retracts and the top box goes up to the upper limit, release your finger from the operation lever.

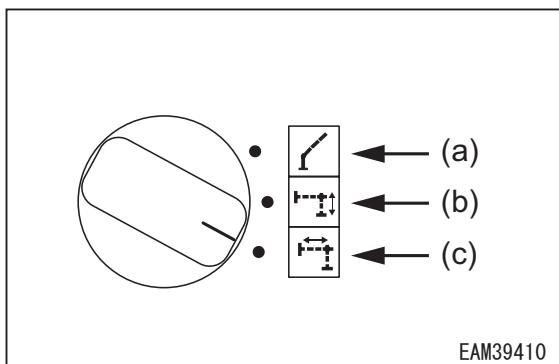


5. Verify that the four outrigger ground set-up lamps (3) on the monitor are flashing in red.



☞ On the outrigger display, the boom stowage lamp (1) (green) is lit up and four outrigger extension lamps (2) and four outrigger ground set-up lamps (3) are flashing in red.

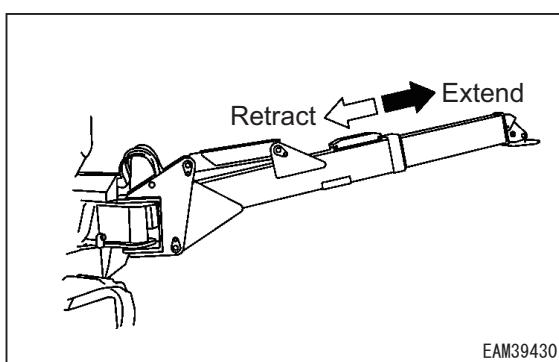
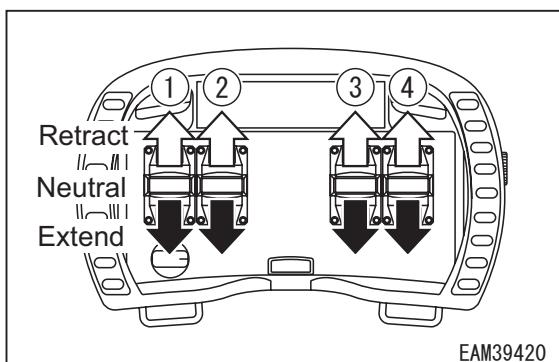
6. Operate the operation mode selector switch to the “Outrigger extension” position(c).



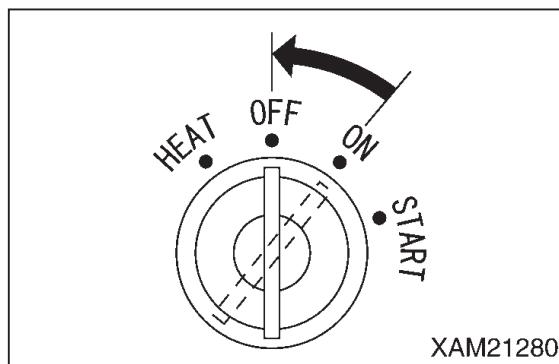
7. Push down an operation lever or two of them at the same time to the “Retract” (push forward) side.

When the extension cylinder fully retracts and the inner box is at its shortest, return the lever to the “Neutral” position.

Operate the remaining levers in the same way and make the inner box of the four outriggers to their shortest. Return the lever to the “Neutral” position.



8. Turn the starter switch to the “OFF” position. The engine will stop.



5.3.2.5 CRANE OPERATION

⚠ WARNING

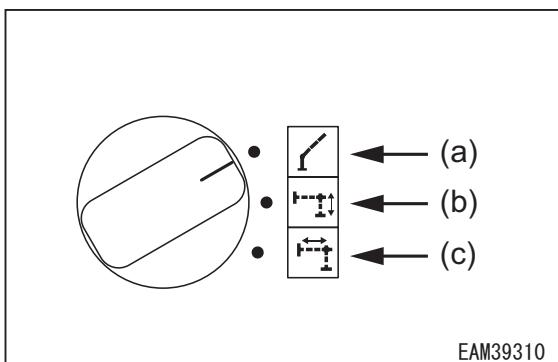
- The following safety messages address a potential Tip Hazard while operating the crane:
 - Verify that all outriggers are positioned correctly before operating the crane. All outriggers must be properly positioned before starting any crane operation.
 - Do not overload the hoist when performing a crane operation. Always keep the load limit within the specified limit as stated in “3.4 RATED TOTAL LOAD CHARTS.”
 - Do not perform multiple operations at the same time. Only perform one operation at a time while hoisting up or down a load. Performing multiple operations while hoisting up or down a load may cause an abrupt change of the load conditions.
 - Always activate the operation lever with caution. It must be properly controlled to keep the appropriate crane operation speed and avoid any abrupt motion. Abrupt acceleration or deceleration, especially while loaded, may cause impact to the crane.
 - Especially avoid sudden lever operations when the load is hoisted, which may cause the load to sway and a give large impact to the crane, and thus may damage the crane or trip the machine.

- Do not operate the machine using the transmitter if the levers do not return to the NEUTRAL position freely. Levers must return to the NEUTRAL position freely for proper operation of the transmitter.

⚠ CAUTION

- Do not exceed the stopping point. Forcing a transmitter lever against its stop could result in damage to the transmitter.
- Check for smooth and free movement of each operation lever on the transmitter. Levers must return to the NEUTRAL position when released.
- Before operating the crane, switch the operation mode selector switch to “Crane.” Leaving the switch in Outrigger mode is extremely dangerous, as the outriggers may operate unexpectedly.

1. Position the outriggers. See “5.3.2.4 OUTRIGGER OPERATION.”
2. Start the engine. See “5.3.2.2 STARTING/STOPPING THE ENGINE.”
3. Switch the operation mode selector switch on the transmitter to “Crane.”



[1] HOOK HOIST UP/DOWN OPERATION

⚠ WARNING

- Do not continue to hoist up the hook if the overwinding detector alarm is activated. Continued operation could cause the wire rope to break.
- Always hoist up or down the hook steadily and slowly when using the winch or telescoping the boom. Do not allow the hook to hoist up or down too quickly for the conditions.

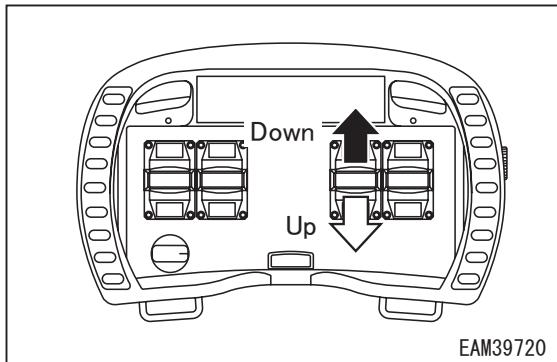
⚠ CAUTION

- Do not let the hook block touch the ground. The wire rope may become tangled on the winch drum, damaging the wire rope.
- With the boom deflection, the hoisted load slightly shifts forward. Notify workers in the area such as slinging operators.
- If the hook block is hoisted excessively, overwinding is detected, and an alarm buzzer sounds. In such a case, immediately shift the right operation lever into the “Neutral” position to stop winding the wire rope.
- If the hook block is unwound excessively, such as during underground work, over un-winding is detected, and an alarm buzzer sounds. In such a case, immediately shift the right operation lever into the “Neutral” position to stop unwinding the wire rope.

Move the operation lever (11) as follows:

- Down: Push the lever forward.
- Neutral: Release your hand from the lever. The lever will return to the “Neutral” position and the hoisting up/down of the hook block stops.

- Up: Pull the lever toward you.
- ☞ Adjust the hoisting up and down speed of the winch by moving the lever forward or backward.



[2] BOOM DERRICKING OPERATION

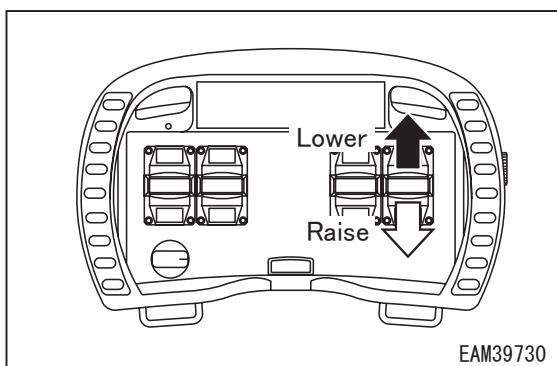
⚠ WARNING

- Operate the lever as slowly as possible.
- When the boom is lowered, the working radius increases, and the rated total load that can be hoisted decreases.

When operating the machine by lifting the boom, exercise caution so that the mass (weight) of the hoisted load is not overloaded when the boom reaches the lowest position.

Move the operation lever (12) as follows:

- Lowering: Push the lever forward.
- Neutral: Release your hand from the lever. The lever returns to the "Neutral" position and the boom derrick stops.
- Raising: Pull the lever toward you.
- ☞ Adjust the derrick speed of the boom by moving the lever forward or backward.



[3] BOOM TELESCOPING OPERATION

⚠ WARNING

- Operate the lever as slowly as possible.
- Do not pull the load horizontally or pull in the load by telescoping the boom.
- When the boom is extended, the working radius increases, and the rated total load that can be hoisted decreases. When working while extending/retracting the boom, pay extra attention so that the mass (weight) of the load at the time the boom is most lowered does not cause overloading.
- When the boom is extended, the hook block is hoisted.
- If the overwinding detector generates an alarm buzzer while the boom is extended, immediately shift the left operation lever into the "Neutral" position to stop the boom operation.

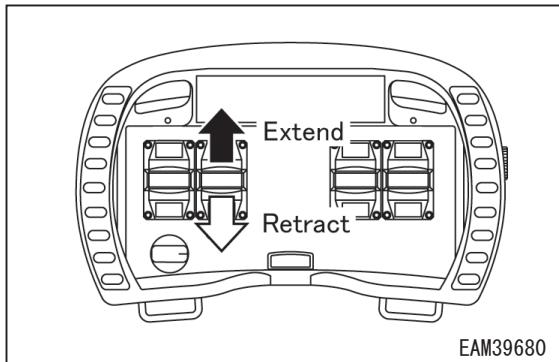
⚠ CAUTION

- The hook block is hoisted up or down while the boom is extended/retracted. Perform the winch operation at the same time to adjust the hook block height.
- When the boom is extended for a long time, the boom slightly retracts due to the temperature change in the hydraulic oil. In this case, extend the boom as needed.

Move the operation lever (10) as follows:

- Extending: Push the lever forward.
- Neutral: Release your hand from the lever. The lever returns to the "Neutral" position and the boom telescoping stops.

- Retracting: Pull the lever toward you.
- ☞ Adjust the boom extension and retraction speed by moving the lever forward or backward.



[4] SLEWING OPERATION

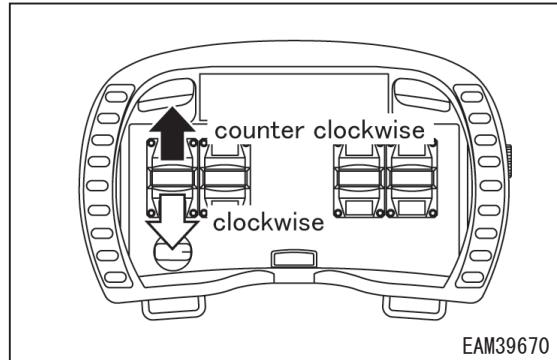
⚠ WARNING

- Always move the accelerator lever slowly and operate the engine at low speed when slewing a load. Do not allow abrupt slewing of the load.
- Check for safety in the vicinity and sound the horn before slewing.
- Operate the lever as slowly as possible. Make sure to start smoothly, slew at low speed, and stop quietly. Especially avoid sudden lever operations when the load is hoisted, which may cause the load to sway and cause the machine to lose balance, and thus may damage the crane or tip the machine.
- Even if the outriggers are set correctly, the hoisted load is slightly unstable in a specific direction. Exercise caution when slewing the boom with a suspended load.
- In some cases, depending on the configuration of the outriggers, the hoisted load may hit the outriggers, resulting in damage to the crane or tip-over of the machine. Exercise caution to prevent the hoisted load from hitting outriggers.

Move the operation lever (9) as follows:

- Clockwise (right): Push the lever forward.

- Neutral: Release your hand from the lever. The lever returns to the "Neutral" position and the slewing stops.
- Counterclockwise (left): Pull the lever toward you.
- ☞ Adjust the crane slew speed by moving the lever forward or backward.



[5] CRANE STOWING OPERATION

⚠ WARNING

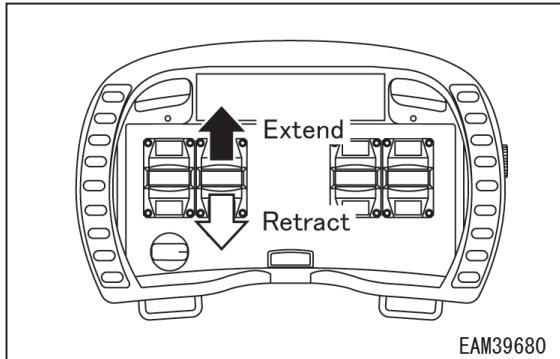
The hook stowage switch cancels the auto stop function of the overwinding detector. Operate the winch lever carefully not to let the hook block hit the boom when stowing the hook block.

⚠ CAUTION

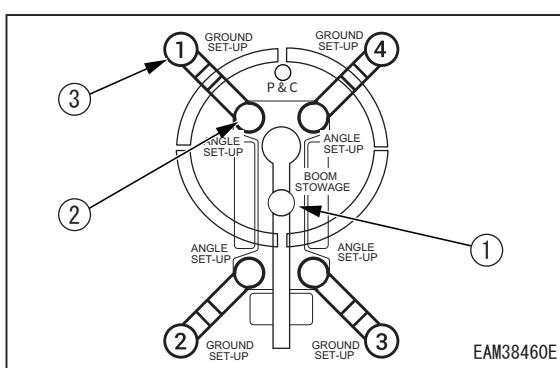
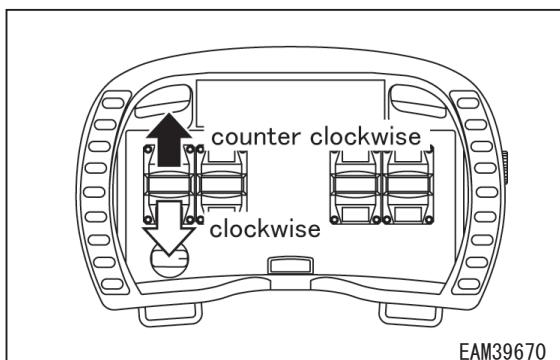
- Stop the slew of the hook block before stowing the hook block.
- When stowing the hook block, do not topple the entire hook block sideways on the ground by loosening the wire rope too much. This will cause the irregular winding on the winch drum.
- The boom "retracting" operation will lift down the hook block. The hook block also lifts down with the boom "lowering" operation. Hoist up the hook at the same time so that the hook block will not touch the ground or interfere with the machine.
- Stow the boom securely into the stowing position. After stowing the boom, verify that the boom stowage lamp on the outrigger display lights up in green. If the boom stowage lamp does not light up,

the outriggers cannot be stowed. If the boom stowage lamp does not light up, lower the boom to the maximum or slew the boom to verify that the boom stowage lamp lights up.

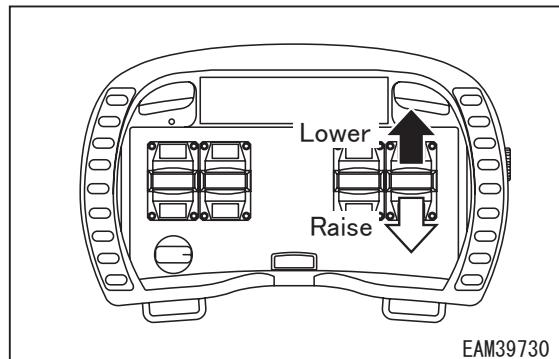
1. Operate the operation lever (10) to the "Retract" (pull toward you) side to fully retract the boom.



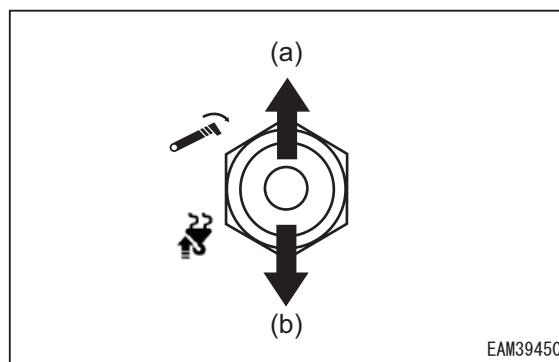
2. Operate the operation lever (9) to the "clockwise (right)" or "counterclockwise (left)" side so that the boom slews to the centre of the machine. At this time, check that the boom stowage lamp (1) is lit yellow. If it is light red, adjust the boom slewing angle.



3. Operate the operation lever (12) to the "Lower" (push forward) side and lower the boom until it automatically stops.

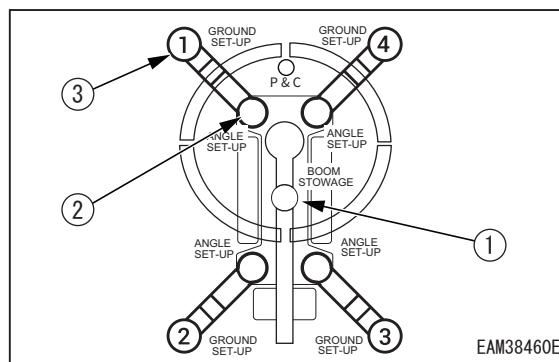


4. With the boom stowage switch (a) on the monitor depressed, operation lever (12) to the "LOWER" (push forward) side to stow the boom in its fully lowered state.



☞ The boom is stowed only while the switch is depressed.

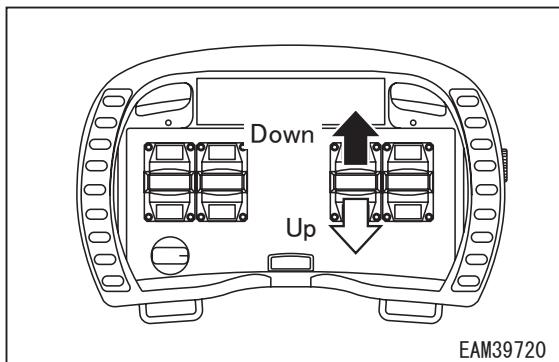
5. Check to confirm that the Boom stowage ramp (1) is light in green. If the light is lit in yellow or lit in red, the boom has not been fully stowed. Check by adjusting the slewing angle and boom derrick angle.



- Green light : Boom is stowed
- Yellow light : Only stowed at slewing stowage position

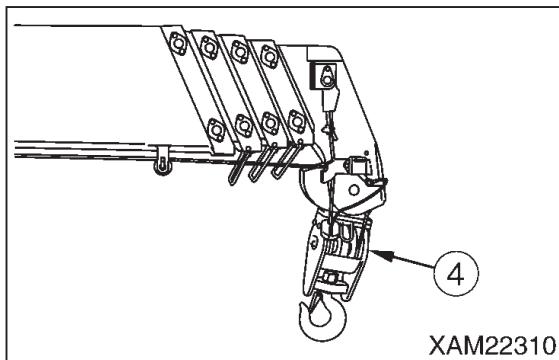
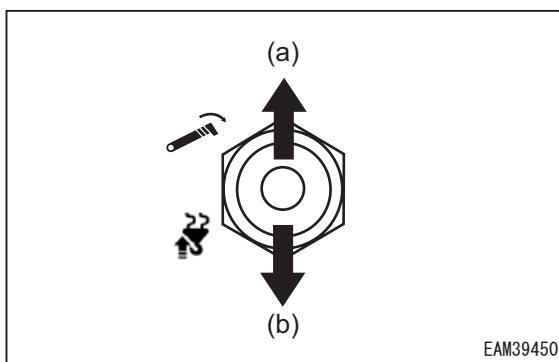
- Red light : Not yet stowed in slewing stowage position or boom fully lowered position.

6. Operate the operation lever (11) to the "UP" (pull toward you) side and hoist up until the hook block automatically stops (overwinding).



☞ Hoisting the hook block too much will result in the detection of overwinding. Then the alarm buzzer is heard and the hook hoisting up operation automatically stops.

7. With the hook stowage switch (b) on the monitor depressed, operation lever (11) to the "UP" (pull toward you) side to stow the hook at the bottom of the boom end.



☞ The hook is stowed only while the switch is depressed.

[6] SPEED SELECTOR SWITCH OPERATION

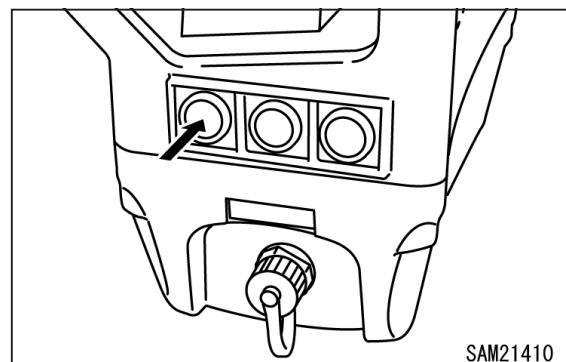
Press the speed selector switch to set or cancel micro speed mode 1~3 or high speed mode.

When it is required to operate the Crane in micro speed, use the micro speed mode, which limits the maximum speed of the Crane and facilitates the smoother control in the micro speed range.

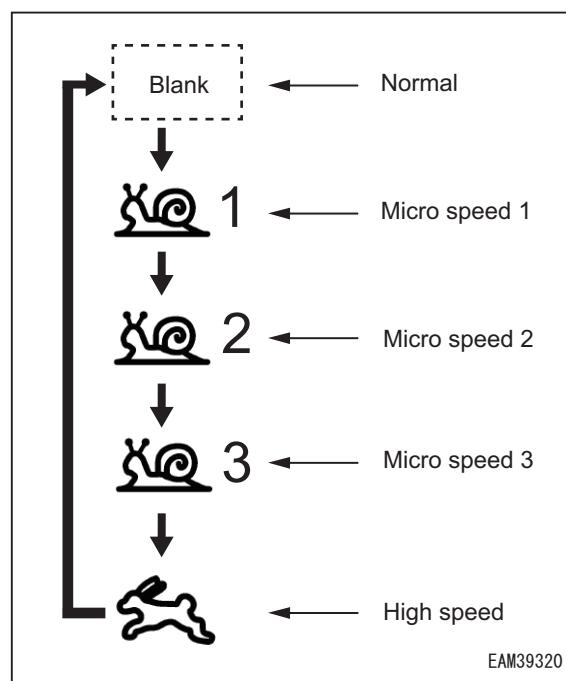
When it is required to enhance the maximum speed of the Crane operation, the high speed mode is also available.

[Setting the micro or high speed mode]

Push the speed selector switch.



Push the speed selector switch to cycle through the display indications as shown in the diagram below:



When the indicated mode fits your requirement, carry on the Crane operation in that condition.

[Cancel the micro or high speed mode]

Push the speed selector switch several times, until display indication reaches "Normal".

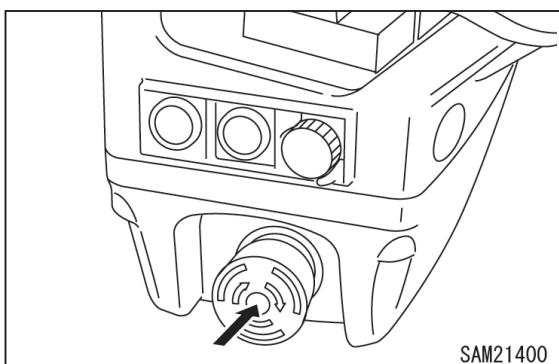
5.3.2.6 EMERGENCY STOP SWITCH (EMO) OPERATION

⚠ CAUTION

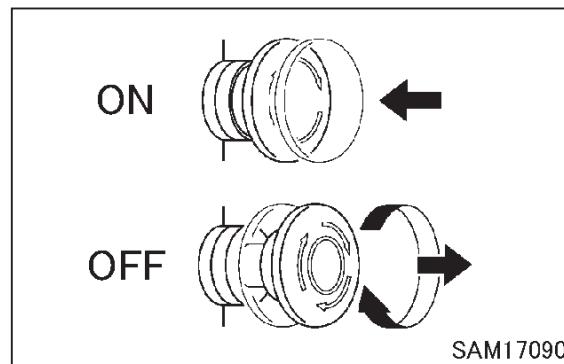
- If any emergency or abnormality in crane operation is experienced, immediately press the emergency stop (EMO)/remote control power OFF switch to stop the engine. The abnormality mentioned above includes: continuation of crane operations even after the release of operation levers, or unexpected crane movements before the operation levers are used.
- In the event of an emergency stop of the engine, investigate the cause for the abnormality and repair the fault location.
- The emergency stop switch (EMO) can also be used for turning OFF the power to the transmitter.

1. Press the Emergency stop (EMO)/Remote control power OFF switch when turning off the power to the transmitter, or in case of an abnormality in crane operations.

The power of the transmitter turns OFF and the engine stops.

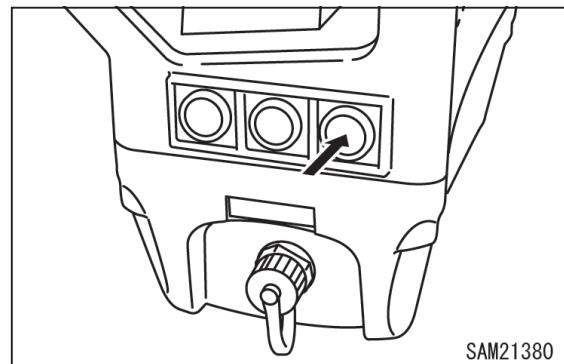


2. To cancel the emergency stop, turn the emergency stop (EMO)/remote control power OFF switch to the right. The switch returns to the original position.



5.3.2.7 HORN SWITCH OPERATION

The horn keeps blowing while this switch is pressed and held.



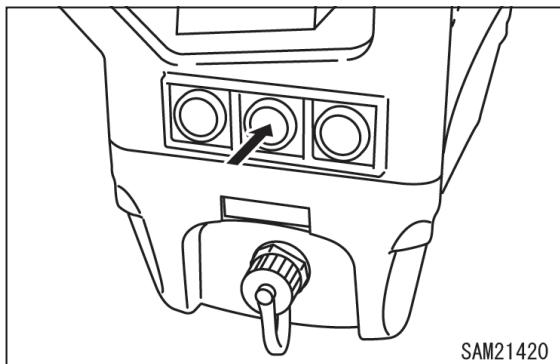
5.3.2.8 BOOM LIFT BYPASS SWITCH OPERATIONS

⚠ WARNING

Operate this switch only if the boom has stopped automatically after entering the overload area while being operated. Never use this switch in normal situations to lift loads off the ground.

Serious accidents such as machine damage or toppling may occur if you use this switch to lift loads off the ground.

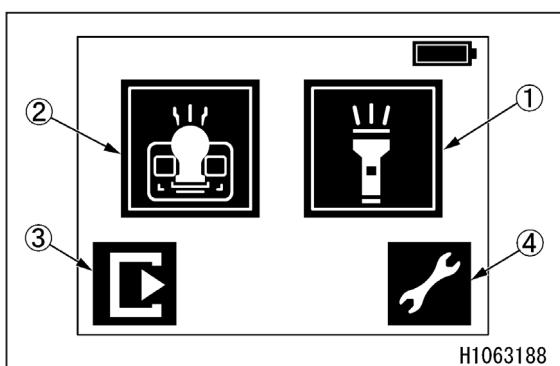
If you are in a situation in which raising the boom during an automatic stop is unavoidable you can lift the boom by pressing the boom lift bypass switch.



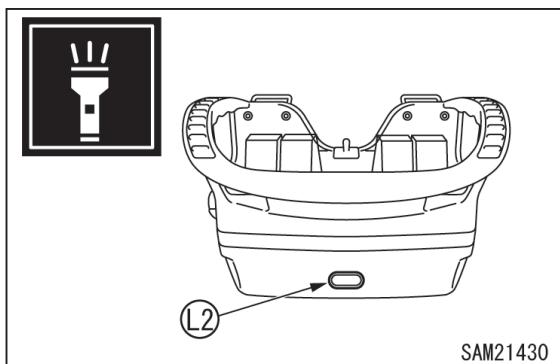
5.3.2.9 LED LIGHT OPERATIONS

Select the LED light on the menu screen to turn the LED light on.

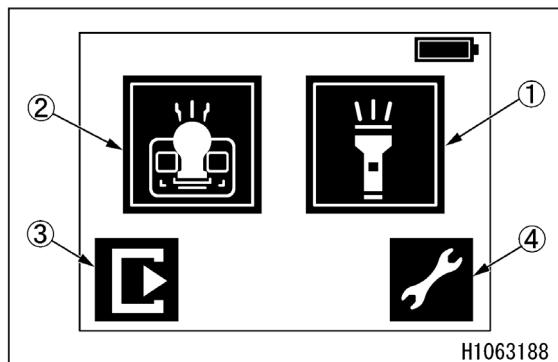
For more information on turning on the lights, see “4.2.3.2 TRANSMITTER DISPLAY COMPONENTS.”



1. LED light (front) ON/OFF



2. LED light (operation panel) ON/OFF



5.3.3 AFTER CRANE OPERATION

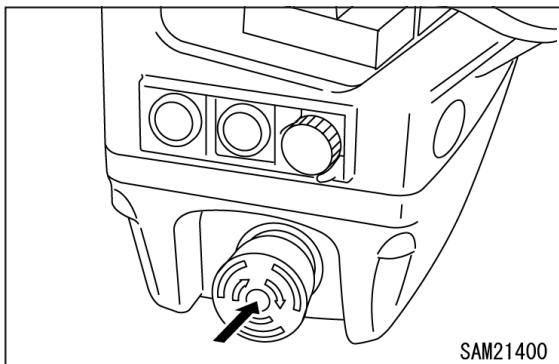
5.3.3.1 STOPPING OPERATION

⚠ WARNING

- When the operation is finished, be sure to press the Emergency stop (EMO)/Remote control power OFF switch on the transmitter to turn OFF the power.
- On no occasion except for crane operations, must the power of the transmitter be turned ON. This could cause unexpected movement of the crane resulting in a serious hazard, such that the crane hitting someone or an object, or the crane could tip.
- When it is required to turn ON the transmitter for the purpose of inspection or such, ensure that the engine is not running.

1. Press the Emergency stop (EMO)/Remote control power OFF switch to turn off power. The engine will shut down at the same time.

- Turn the Starter Switch on the machine main unit to "OFF" to turn off power.



5.3.3.2 INSPECTION AFTER ENDING REMOTE CONTROL SYSTEM OPERATION

- Inspect the transmitter and receiver after ending remote control system operations.
 - Check operation levers and switches of the transmitter for any faults.
 - Wipe off oil or dirt with a clean cloth.
 - Repair all cracks or damages without fail.
- To store the transmitter, avoid places subject to wind, rain, direct sunlight, high temperatures and high humidity.

5.3.4 HANDLING TRANSMITTER BATTERY

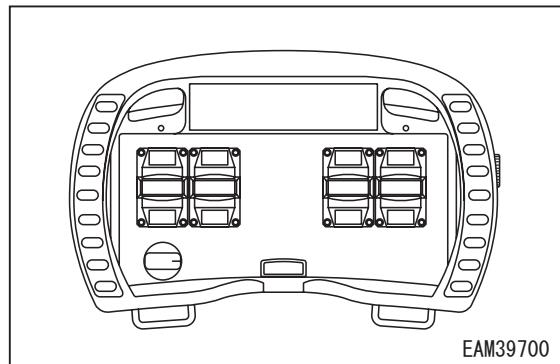
IMPORTANT

The battery used for the transmitter is an exclusive battery.

5.3.4.1 REPLACEMENT TIMING OF BATTERY

If the battery runs low, recharge the battery or replace the battery with a charged battery.

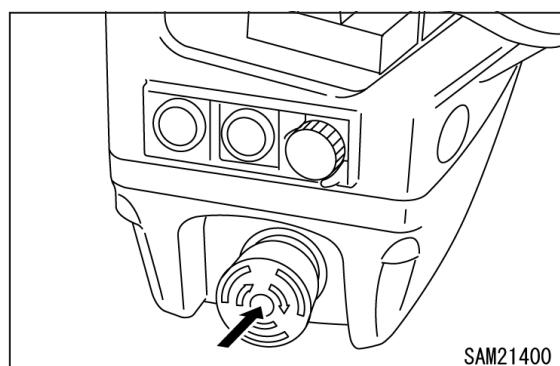
If the battery is not replaced, the transmitter will stop in a few minutes.



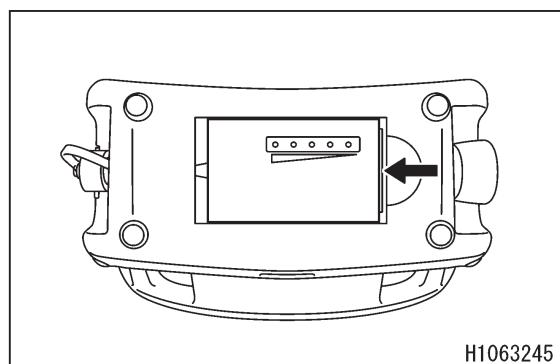
5.3.4.2 BATTERY REPLACEMENT

Replace the battery of the transmitter in the procedure described below.

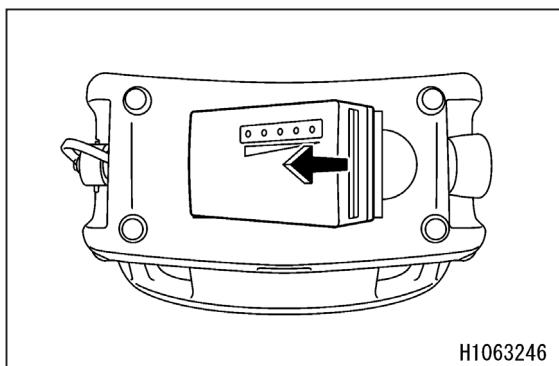
- Turn OFF the power of the transmitter. Pressing the Emergency stop (EMO)/ Remote control power OFF switch will turn OFF the power.



- Lift the battery upward while pushing it. The battery comes off.



3. Insert a charged battery into the transmitter while pushing it.



4. Press the Transmitter Power Switch and verify that power goes on.

☞ The power will not go on if you pressed the Emergency stop (EMO)/Remote control power OFF switch.

5.3.4.3 CHARGING METHOD OF BATTERY

To charge the battery, use only the genuine battery charger.

⚠ WARNING

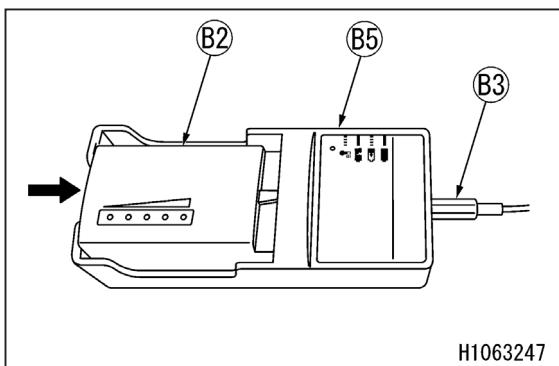
- Use the battery charger only for charging of the battery described on the model label.
- Do not charge the battery in an explosion hazardous area under any circumstances.
- Use the battery charger with correct voltage: 100 to 240 VAC, 10 to 30 VDC.
- Do not use the battery charger outside the described temperature range.
- Protect the battery charger from overheat, dust, humidity, etc.
- Do not cover the battery charger with an object during charging.
- Unplug the battery charger from the power supply when not in use.
- If any damage is found on the battery charger body or its cord, stop using it at once.
- Do not modify or change the battery charger or cord.

⚠ CAUTION

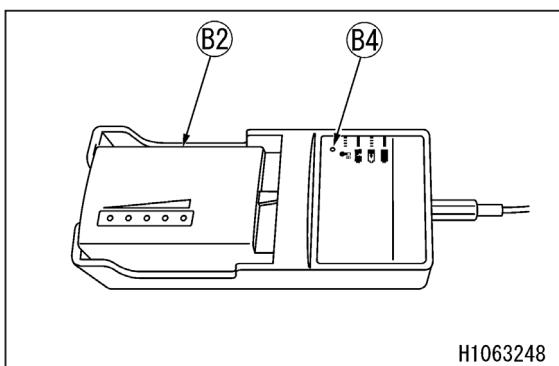
- The battery capacity depends on the number of years used and ambient temperature. The capacity decreases when the battery becomes old.
- The battery capacity decreases significantly in extreme temperatures, below 0°C or over 40°C.
- Before first use, or when at least six months have elapsed since the last use, be sure to charge the battery.
- Charge the battery at ambient temperatures between 0 to 40°C.
- If the battery status symbol on the transmitter indicates low battery levels or the battery symbol flashes in red, recharge the battery or replace the battery with a charged battery.
- It is ideal to store the battery in a 30 to 50% charged condition if it is going to be stored for a long period of time.
- Keep the battery at room temperature.
- Use the supplied protective cap to store the battery. Never short out the battery.
- When the battery is correctly used, it can be charged at least 500 times.
- The battery can be charged more than 500 times, however, the maximum capacity may decrease.
- When charging a fully discharged battery, it takes about 5 hours to fully charge the battery.

Charge the battery of the transmitter in the procedure described below.

1. While pushing the battery (B2), put it into place in the charger case (B5).



2. Connect the battery charger (B1) to the cord (B3), and insert the cord plug into the power outlet.
3. The battery status LED indicator (B4) on the charger starts flashing to indicate the charging has started.



4. When the battery becomes fully charged, the LED indicator (B4) is lit in green.
5. After charging is completed, disconnect the cord plug from the power supply.

☞ The battery status indicator while charging is as follows:

- Lights in green: Charged
- Flashes in green: Charging
- Lights in red: Battery failure
- Flashes in red: Cannot be charged due to a battery temperature: below 0°C or above 45°C.

5.4 ELECTRIC MOTOR(OPTION)

⚠ WARNING

The following precautions should always be observed when using the machine abiding by engine and electric motor specifications. Potential serious accident may occur if disregarded.

- Installation of this machine must comply with laws and regulations of your country. Contact us or our sales service agency if no laws and regulations are applied.
- Only personnel qualified according to laws and regulations of your country are allowed to establish power connection of power supply equipment, inspect and repair the electric system. Contact us or our sales service agency if no laws and regulations are applied.
- Operation and storage of this machine must satisfy the requirements listed below:
- Operating temperature: -10 to 40°C (no frost)
- Storage temperature: -20 to 60°C
- Operating humidity: Max. 90%RH (no condensation)
- Atmosphere: Outdoor environment free from explosive, flammable, and corrosive gases, moisture, and excessive dust particles
- Altitude: Max. 1000m
- Vibration: Max. 0.5G
- Turn OFF the power supply equipment breaker promptly in the event of an abnormal event in this machine during operation. Potential fire or electric shock may occur if disregarded.
- Turn OFF the power supply equipment breaker promptly in the event of a power failure during operation. This machine may go into action upon energisation.

- Always turn OFF the power supply equipment breaker before performing inspection and maintenance of the electric system. Potential electric shock may occur during work if disregarded. Before inspection and maintenance, inform all personnel to alert them of your action. Be sure to attach a warning tag, "Do Not Touch", to the power supply equipment breaker for the prevention of accidental breaker operation conducted by other personnel.
- Always turn OFF the power supply equipment breaker and wait for 10 minutes or longer before performing inspection and maintenance of the electric system. Ensure that no voltage is applied to the power supply box with a tester.
- All the parts will be at elevated temperatures immediately after machine operation. Perform inspection and maintenance of the electric system according to the procedure provided in this manual only after the parts drop in temperature for safety. Potential burn may occur if disregarded.
- Keep the power supply box and inverter board away from water. The machine goes out of order that causes malfunction if the electric system is wetted. Exercise due caution to handle the electric system.
- Contact us or our sales service agency to request repair of the inside of the inverter board, when necessary.

⚠ CAUTION

See "Chapter 2 SAFETY" for safety precautions that are not provided in this section.

The weight (mass) of a machine varies with machine types between a standard specification machine and a machine abiding by engine and electric motor specifications.

See the following figure for the weight (mass) of the machine described in "5.8.5 CAUTIONS DURING TRANSPORTATION."

MC405C	
MACHINE WEIGHT	
Component	Weight
Main Unit	5640 kg
Electric Unit	+150 kg
850 kg Searcher Hook	+30 kg
Fly-Jib	+150 kg

104-4896900

5.5 ELECTRIC MOTOR OPERATION

5.5.1 CONNECTING POWER SUPPLY CABLE

⚠ WARNING

The following precautions should always be observed. Potential serious accident may occur if disregarded.

- Be sure to supply the machine specifications-compliant power (AC 380, 400V) to this machine.

Power supply voltage (V)	Power current (A)	Power supply frequency (Hz)
380, 400	15	50

- A cabtyre cable must adhere to the specifications of this machine (AC 380, 400V).

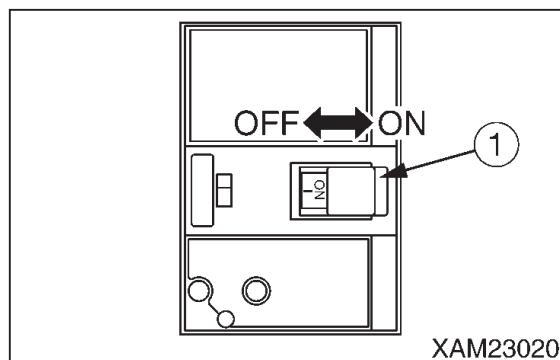
Motor voltage (V)	Cable spec. (sq)	Cable length (m)
380, 400	3.5	20
	5.5	40

- Always use a dry cabtyre cable. Potential electric shock may occur if the cabtyre cable terminal is wet or power connection is performed with moisten hands.
- Always turn OFF the main breakers of power supply equipment and this machine before connecting the cabtyre cable to this machine.
- Keep the cabtyre cable free of flaws and bend. Be sure to replace a damaged cabtyre cable with a new one.
- Ensure that no sharp protrusion is present at an area where the cabtyre cable is routed. Failure to follow the above precaution may cause the cable to get snagged on the protrusion and damaged or broken.

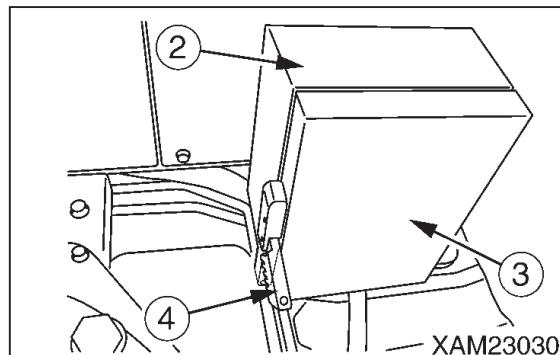
- To connect the cabtyre cable to the terminal block in the power supply box, torque the screw to the specified value. Potential fire or electric shock may occur if the screw comes loose that could develop a short circuit.
- To connect the cabtyre cable to the terminal block in the power supply box, tighten the cable ground screw properly for the prevention of water entry and cable protection.
- The ground wire of the cabtyre cable must be properly connected to the “PE terminal” at the bottom of the terminal block in the power supply box.
- Always close the power supply box door completely after work, and attach the Inverter unit cover properly.

Use the following procedure for establishing power connection between power supply equipment and this machine.

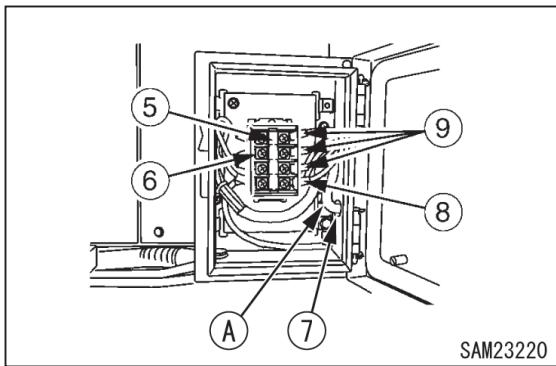
1. Make sure the breakers of power supply equipment and Inverter unit are OFF.



2. Unlock the door (3) of the power supply box (2) by pulling the handle (4) toward you to open it.



3. Remove the cover (6) of the terminal block (5) in the power supply box, holding the top and bottom of the cover (6) with fingers and pulling it toward you.



4. Draw the machine specifications-compliant cabtyre cable (A) through a hole of the cable ground (7) at the bottom of the power supply box to connect it to the terminal block (5).

⚠ CAUTION

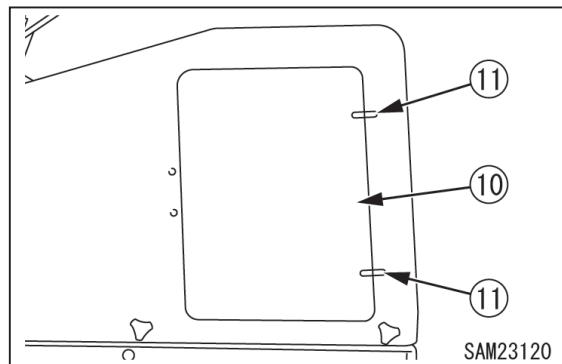
The ground cable (8) of the cabtyre cable must be properly connected to the “PE terminal” on the terminal block. Inverter-driven three cables (9) other than the ground cable are capable of being connected to any of “L1, L2, and L3 terminals”.

5. Upon completion of connection of the power supply box cabtyre cable (A), replace the cover (6) of the terminal block (7) and close the door (3) of the power supply box (2).

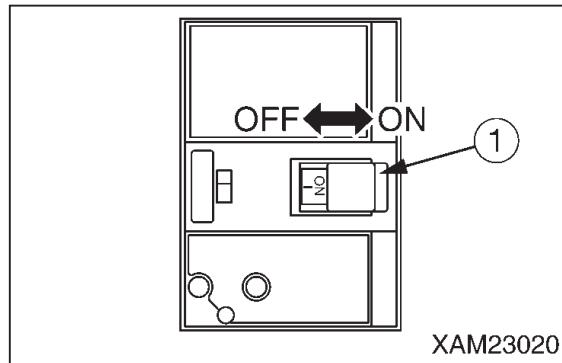
6. Move and connect the cable terminal block to the power supply equipment breaker without undue strain on the cabtyre cable (A).

7. Turn ON the power supply equipment breaker.

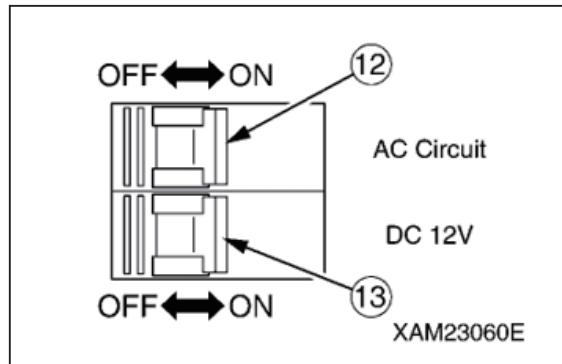
8. Remove the four mounting screws (11) and remove the protective cover (10).



9. Turn ON the breaker (1).



10. Turn ON the AC circuit power switch (12) and DC12V power switch (13). Turn ON the breaker (1).



☞ No safety hazard is posed even if the AC circuit power switch (12) and DC12V power switch (13) remain ON.

11. Replace the protective cover (10) to the original position and securely tighten four mounting screws (11).

5.5.2 OPERATION AND CHECKING AFTER POWER CONNECTION

⚠ WARNING

- Before starting the electric motor, make sure of no presence of personnel around and impediments, and sound a horn.
- Warm-up is required. The motor needs adequate warm-up especially in cold climates.
Failure to warm the motor may result in serious accident on account of low reactivity of the travelling gear and crane to the operating lever.
- Ensure that no abnormal noise, odour, or vibration is present in and around the Inverter unit and power unit during warm-up. If abnormal conditions are encountered, immediately turn the starter switch to the OFF position to bring the machine to a halt. Turn OFF the power supply equipment breaker accordingly to shut off the supply source.
Check the Inverter unit and electric motor, the peripheries, and electric wiring for burnt smell and parts. Promptly contact us or our sales service agency to request inspection and repair.
- Crane operational check is necessary after motor warm-up.
Keep the hook block away from the boom to avoid interference and collision.
- Exercise caution to keep the boom from contact with an operator and this machine when slewing it.
- If crane operational check detects an abnormal event, make an emergency stop promptly and repair a relevant part.
Potential serious accident may occur if disregarded.

- Exercise caution not to travel on or entangle the cabtyre cable during crane travelling.

Staff guide personnel as necessary, and follow the lead of them.

- Keep the Inverter unit cover away from flammable materials.

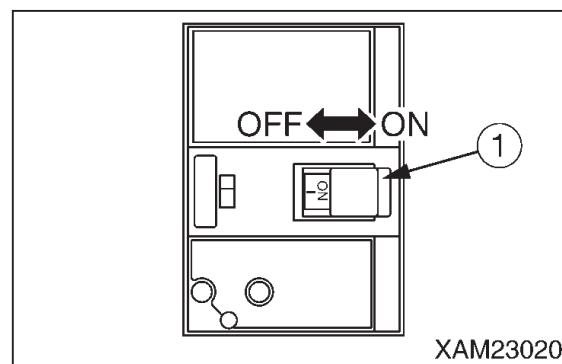
The inside of the Inverter unit will rise in temperature that may lead to fire, if disregarded.

IMPORTANT

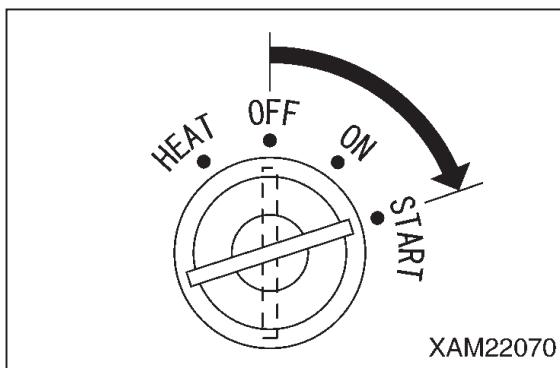
- Proper temperature of hydraulic oil: 50 to 80°C

The hydraulic oil should be at around 20°C regardless of operational environment such as low-temperature operation.

1. Make sure the breakers of power supply equipment and Inverter unit are ON.
☞ Power switching between engine and electric motor is determined by the 'ON/OFF' of the main breaker.

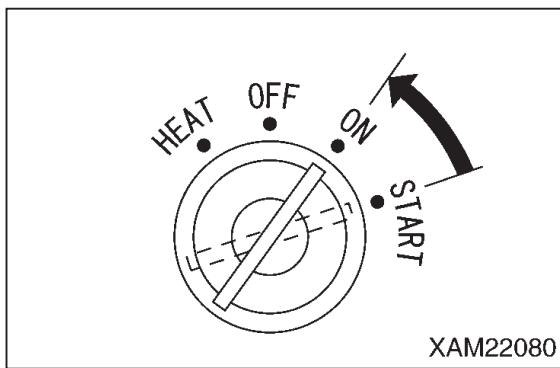


2. Insert the key into the starter switch and turn the key to the "START" position.



3. Release your hand from the key once the electric motor has started.

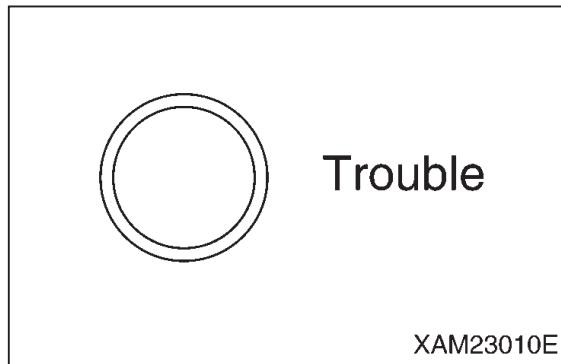
The key will automatically return to the "ON" position.



4. Conduct 5-minute warm-up after the electric motor is started.

☞ This machine is structured to switch to the energy-saving mode if no lever operation is attempted within 5 minutes after the electric motor is started. Once the energy-saving mode has been entered, the electric motor undergoes an extreme reduction in rotational speed. Operate any lever for recovery from the energy-saving mode. The electric motor comes to a stop if no lever operation is attempted within further 30 minutes after being started. Turn the starter switch to the "START" position again for recovery.

5. Visually check through the access protective cover of the Inverter unit that the trouble lamp remains OFF.

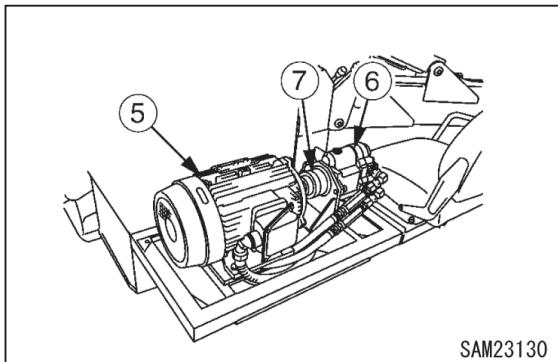


⚠ CAUTION

An error occurs in the Inverter unit, which causes the trouble lamp to come ON in red. Contact us or our sales service agency.

6. Use the following procedure for checking the power unit if an abnormal noise, odour, or vibration is present in and around the power unit.

1. Turn the starter switch key to the "OFF" position.
The electric motor comes to a stop.
2. Remove the rear cover (3) as described in "Removing Rear Cover" on page 5-19.
3. Check the mounting bolts securing the electric motor (5) and hydraulic pump (6) for looseness and falling off, and check the coupling (7) for looseness.
If check finds looseness, torque the bolts to the specified value to provide retightening.



4. Keep the periphery of the power unit free of dead leaves, paper waste, and dust.
Eliminate dead leaves, paper waste, and dust if heaped or adhered.
5. After inspecting or cleaning, reattach the rear cover (3) as described in "6.8 REAR COVER."

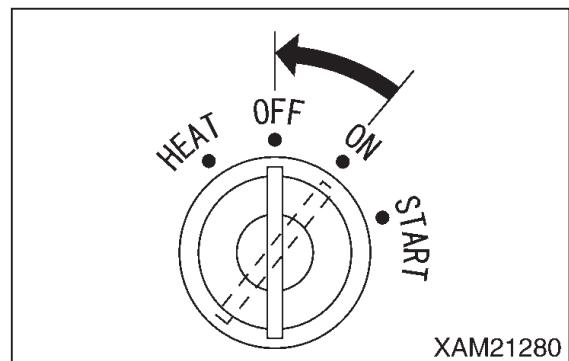
5.5.3 MACHINE OPERATION

⚠ CAUTION

For more information on individual crane operations, see the sections from "5.2.5 TRAVELLING POSTURE" to "5.2.25 DOS AND DON'TS DURING CRANE OPERATIONS."

5.5.4 MACHINE STOP AND CHECKS AFTER STOPPING MACHINE

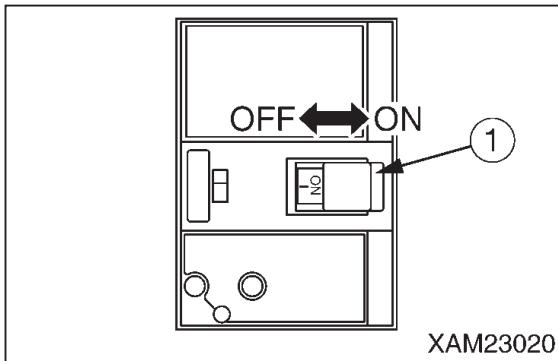
1. Turn the starter switch key to the "OFF" position.
The electric motor comes to a stop.



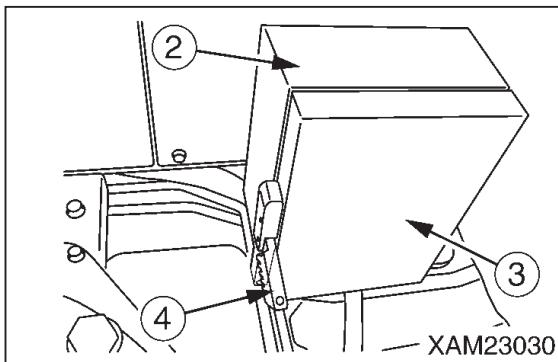
2. Remove the starter switch key.
3. Visibly check for oil leakage, and check around the crawlers, crane, and exterior of the machine. If you find any leakage or abnormality, fix the problem.
4. Clean off the crawlers and outriggers, removing mud.
5. Keep the periphery of the inverter unit free of dead leaves and paper waste. Potential fire may occur if disregarded.

5.5.5 DISCONNECTING POWER SUPPLY CABLE

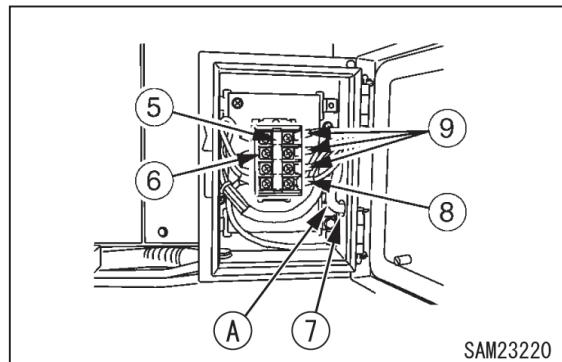
1. Turn OFF the power supply equipment breaker.
2. Remove the rear cover as described in "6.8 REAR COVER."
3. Turn OFF the main breaker (1).



4. Replace the protective cover (10) to the original position and securely tighten four mounting screws (11).
5. Unlock the door (3) of the power supply box (2) by pulling the handle (4) toward you to open it.



6. Remove the cover (6) of the terminal block (5) in the power supply box, holding the top and bottom of the cover (6) with fingers and pulling it toward you.



7. Disconnect the cable (8) and three cables (9) of the cabtyre cable (A) from the terminal block (5).

⚠ CAUTION

- Clean off the cabtyre cable and check it for damage or bend.
If check finds damage, replace the cable with a new one.
- Always return the cabtyre cable to a designated place after performing inspection and cleaning.

8. Replace the cover (6) of the terminal block (5) to the original position and close the door (3) of the power supply box (2).
9. Reattach the rear cover as described in "6.8 REAR COVER."

5.6 SEARCHER HOOK SAFETY PRECAUTIONS

- For more information on precautions not described here, see “Chapter 2 SAFETY”.

5.6.1 HANDLING PRECAUTIONS

Moment Limiter Settings Check

When using 850 kg or 1.5t searcher hook, confirm that the searcher hook setting is set to the following wire falls/option mode and searcher hook position: “850 kg or 1.5t searcher hook mode.”

If the crane is operated in a mode other than 850 kg or 1.5t searcher hook mode, the moment limiter will not operate correctly, posing risk of machine damage, toppling, or other serious accidents.

Precautions When Attaching/Removing Main Unit or Altering Position

- Be sure to tighten the searcher hook mounting bolts using the specified torque to keep the searcher hook from falling when it is being attached.
- Keep fingers out of the pin holes at all times.
- The position pins must always be secured using lynch pins. Serious accidents may result if the position pins become detached during operations.

5.6.2 OPERATING PRECAUTIONS

Precautions Using Boom Lift Bypass Switch

Use the boom lift bypass switch only in 850 kg or 1.5t searcher hook mode.

In contrast to regular crane operations, if the crane is overloaded in 850 kg or 1.5t searcher hook mode, the operation will stop automatically. Use the boom lift bypass switch only when the boom has stopped automatically after entering the overload area while being lowered or extended. Do not use this switch in normal situations to lift loads off the ground. Serious accidents such as machine damage or toppling may occur if you use the boom lift bypass switch to lift loads off the ground.

5.6.3 850kg SEARCHER HOOK OPERATION

5.6.3.1 INSTALLATION OF 850kg SEARCHER HOOK

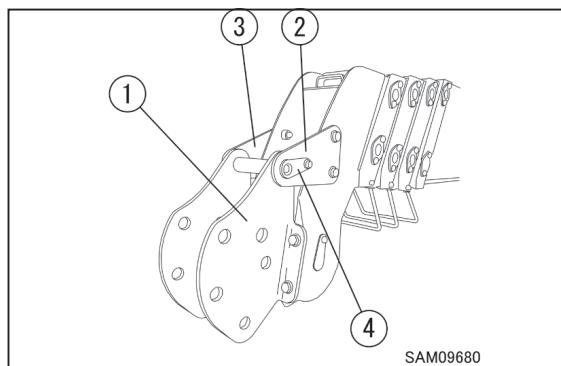
⚠ CAUTION

The overwinding detector must be turned off if the searcher hook is used with the hook block detached.

See “4.1.7.2 [3] OVERWINDING SH ON/OFF SETTING.” for how to change this setting.

However, if the overwinding detector is turned off when using the searcher hook with the hook block attached, the overwinding detector will not operate. In such case, the hook block is in danger of falling off.

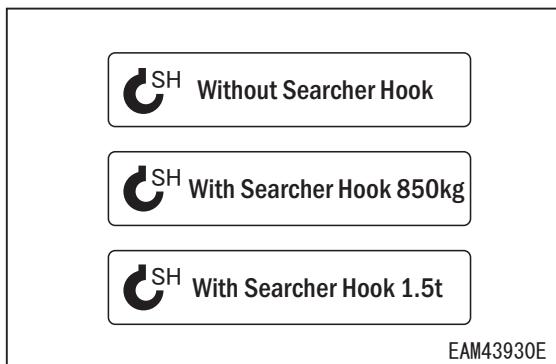
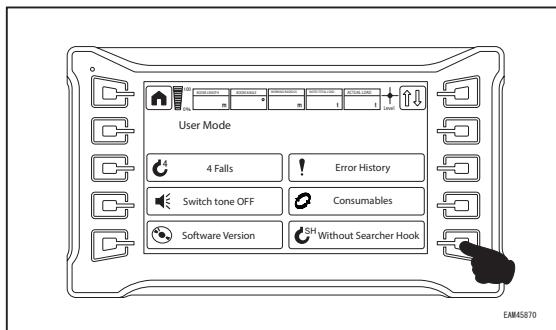
1. Install bracket (1), (2), and (3) using M12 bolts with washers (strength 10.9), nuts, and washers to main boom.
Using torque wrench, tighten bolts at 93N·m ($\pm 14N\cdot m$).
Then insert pin (4) into holes of bracket (1), (2), and (3) as shown in the drawing, and tighten M8 bolts with washers (strength 10.9) at torque 27N·m ($\pm 8N\cdot m$).



⚠ DANGER

Crash Hazard. Make sure to torque searcher hook mounting plate bolts to the designated tightening torque.
To install searcher hook, always use new genuine Maeda bolts, nuts, and washers.

2. Use the searcher hook setting switch on the user mode screen and select “With Searcher Hook 850kg”.



⚠ DANGER

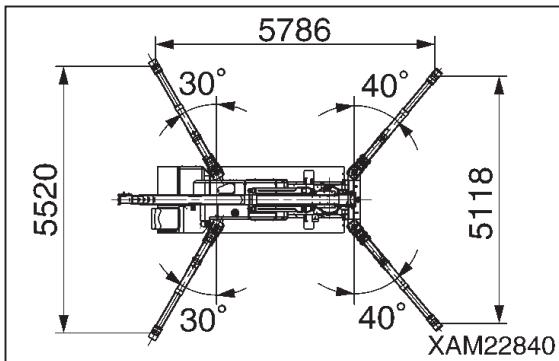
Do not use the 850kg searcher hook unless “With Searcher Hook 850kg” is selected.
Do not operate 850 kg searcher hook without setting moment limiter at “850 kg searcher hook mode”. Without setting in correct mode, moment limiter will not work properly, and thus may result in crane damage or a serious accident.

⚠ CAUTION

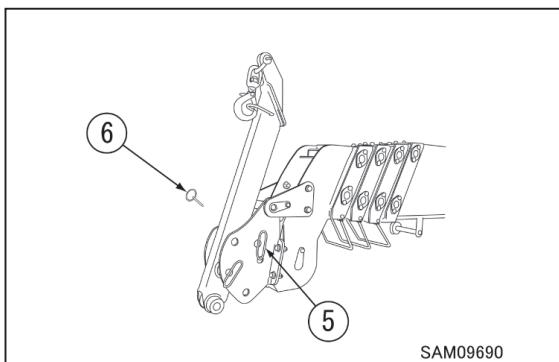
The last status of hook input and the searcher hook setting is memorised even after starter switch is turned to the OFF position.

5.6.3.2 CHANGING SEARCHER HOOK POSITION

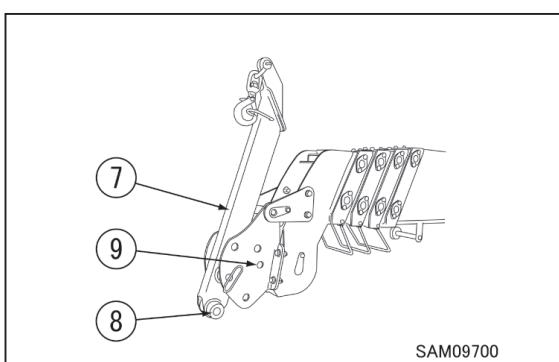
1. See "5.2.13 OUTRIGGER SETTING" 5-22 and set the outrigger.



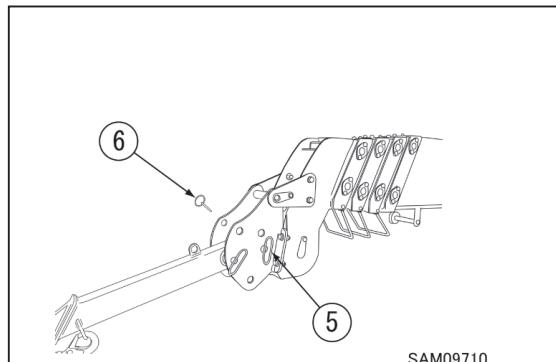
2. Remove the lynch-pin (6) from the end of position pin (5), and remove the position pin (5).



3. Line up the hole (8) in E-boom (7) tip and hole (9) in bracket.



4. Insert the removed position pin (5) (in procedure 4.) through the hole of bracket (9), and secure with lynch pin (6) to the tip of position pin (5).

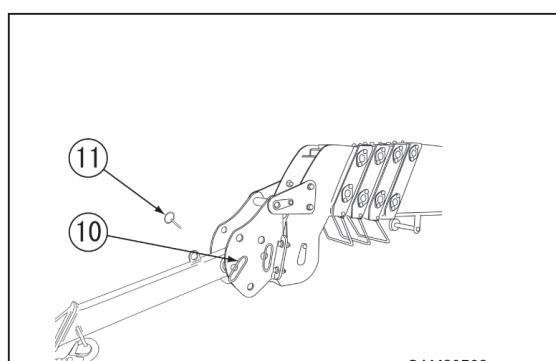


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⚠ DANGER

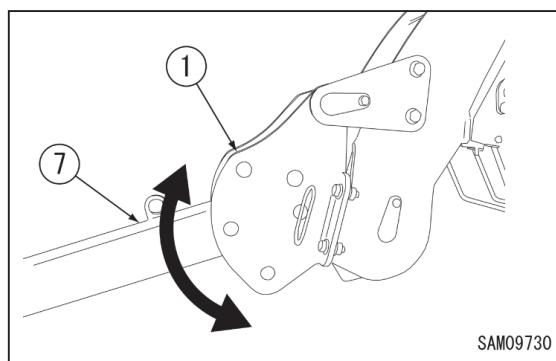
Always secure the position pin (5) with the lynch pin (6). If the position pin falls out during operations, serious injury or damage to the machine may result.

5. Remove lynch pin (11) from the tip of position pin (10), and remove the position pin (10).



SAM09720

6. Move E-boom (7) to the required angle for the work, and line the holes (1) in the E-boom (7).

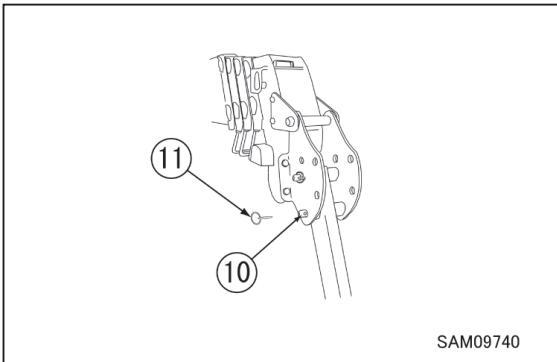


SAM09730

⚠ DANGER

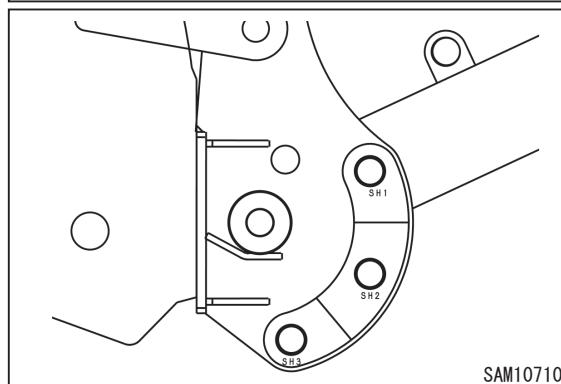
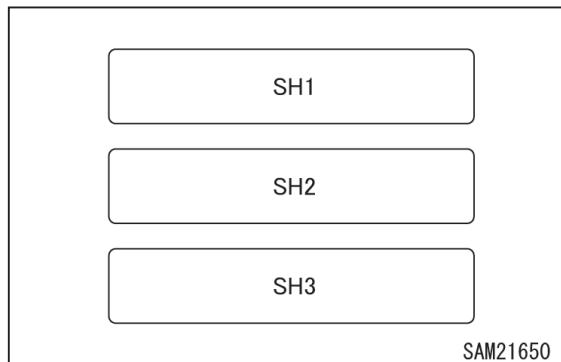
E-boom and hook may interfere with each other in restricted area on rated total load chart, and it may cause a serious accident. Always adjust boom angle to proper position for the work.

7. Insert the position pin (10) through the hole of bracket, and secure with lynch pin (11) to the tip of position pin (10).


⚠ DANGER

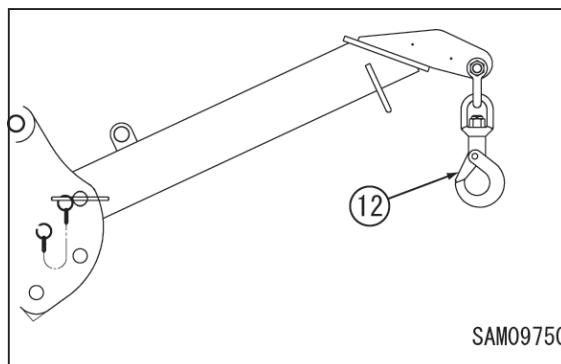
Always secure the position pin (10) with the lynch pin (11). If the position pin falls out during operations, serious injury or damage to the machine may result.

8. Adjust the position setting on the monitor to match the actual searcher hook position.


⚠ DANGER

Do not use 850 kg searcher hook if actual searcher hook offset position and the searcher hook position display do not match. Without setting moment limiter to the actual searcher hook offset position, moment limiter may not work properly and thus may result in crane damage or machine tipping and could cause a serious accident.

9. Attach the load securely to the hook (12) and start operations.



⚠ DANGER

When hoisting a load in 850 kg searcher hook mode, raise boom to hoist the load off the ground, and stop for a while to check if the load is safe to hoist.

- ☞ Characteristic of moment limiter display
At certain working conditions, moment limiter may display bigger load value than actual load.
Sudden lever operation increases error in reading load. When operating boom derricking lever, move the lever slowly.

5.6.3.3 HOW TO USE THE BOOM LIFT BYPASS SWITCH

⚠ DANGER

The boom lift bypass switch should be used only when the machine has stopped automatically after entering the overload area while boom derricking.

If the machine stops automatically after entering the overload area while boom telescoping, retract the boom to restore operations.

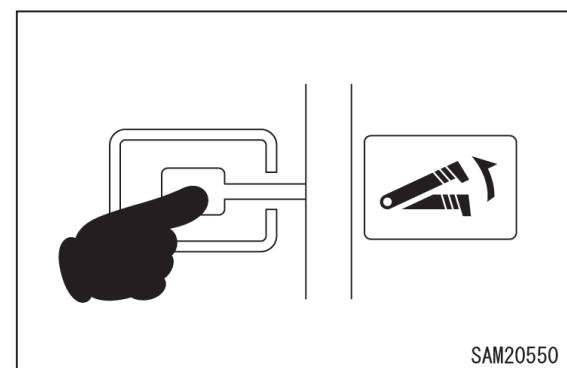
Never use the switch for normal lift-off operations.

Using this switch for lift-off operations may cause serious accidents such as damage to the machine or toppling.

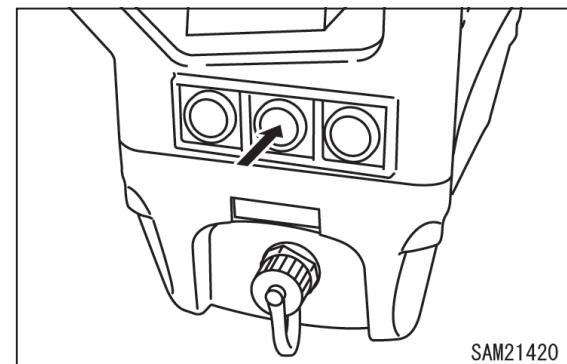
In case machine is automatically stopped by entering overload area by boom lowering or boom extending operation, recover from the overload area by retracting boom, and then lower the load by boom lowering operation. If it is unavoidable to operate boom raising, the boom lift bypass switch can be used to raise the boom.

When you operate boom raising using the boom lift bypass switch, operate the boom raising while keeping the switch to ON.

After the operation is completed, the switch automatically returns to "OFF" when you take your hand off the switch.



SAM20550



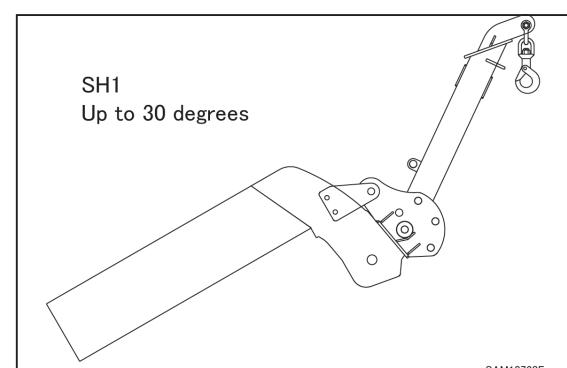
SAM21420

- ☞ When working envelope is set, and operation automatically stops at the boom upper angle limit or hook height upper limit, boom can be raised beyond the limit by using this boom lift bypass switch.
Auto-stop function does not work when this switch is used after operation is stopped by working range limit setting, so please be careful.

⚠ CAUTION

E-boom and hook may interfere with each other in RESTRICTED AREA on Rated Total Load chart.

Do not exceed 30 degrees of boom angle when E-boom offset position is in SH1.



SAM10720E

5.6.4 1.5t SEARCHER HOOK OPERATION

5.6.4.1 INSTALLATION OF 1.5t SEARCHER HOOK

⚠ DANGER

Make sure to torque searcher hook mounting plate bolts to the designated tightening torque.

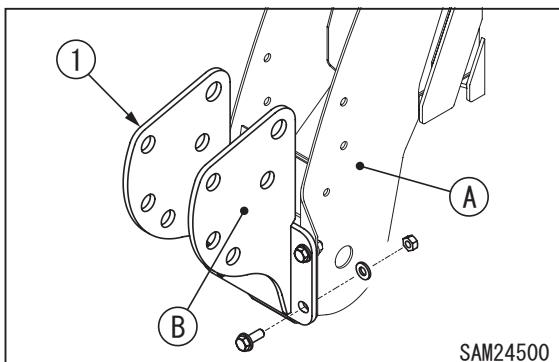
To install searcher hook, always use new genuine Maeda bolts, nuts, and washers.

1. Install bracket (1) using M12 bolts with washers, nuts, and washers to main boom head.

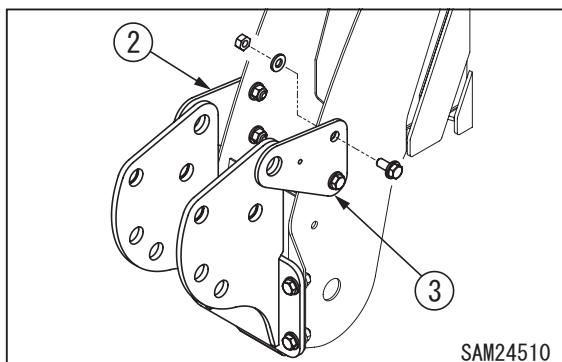
At this time, install so that the side (A) of the boom head and the side (B) of the bracket are to be on the same plane.

Designated torque :

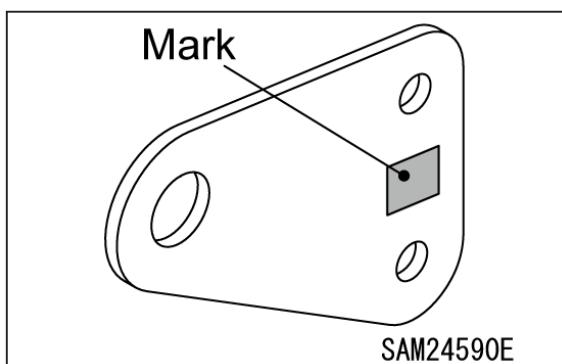
$111\pm12 \text{ N}\cdot\text{m}$ ($11.3\pm1.2 \text{ kg}\cdot\text{m}$)



2. Lightly tighten bracket A (2) and bracket B (3) to the head of the boom using M12 washers with bolts, nuts and washers.



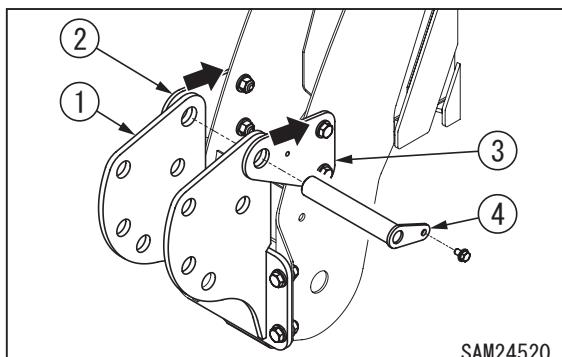
☞ There are engraved number "4" on both the bracket A (2) and bracket B (3) of MC405C. This indicates these brackets are for MC405C, so please make sure the number is "4", before installation.



3. Insert the fixing pin (4) through the hole in bracket B (3) and pass it through all the holes in bracket (1) and bracket A (2). Fix the fixing pin (4) to the bracket B (3) with bolts with M8 washers.

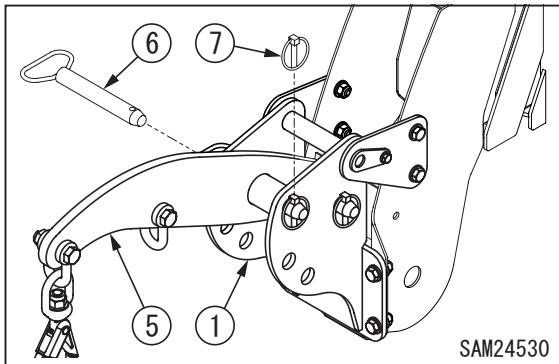
Designated torque :

$31\pm3 \text{ N}\cdot\text{m}$ ($3.2\pm0.3 \text{ kg}\cdot\text{m}$)



4. While pressing bracket A (2) and bracket B (3) to the direction of the arrow, tighten the bolt lightly tighten in the procedure 2.
Designated torque :
 $111\pm12\text{ N}\cdot\text{m}$ ($11.3\pm1.2\text{ kg}\cdot\text{m}$)

5. Fix the E-boom (5) into the bracket (1) by inserting the position pin (6).
Secure the position pin (6) with the lynch pin (7) so that it does not come off.



5.6.4.2 CHANGING SEARCHER HOOK POSITION

⚠ DANGER

- Do not use 1.5t searcher hook if actual searcher hook offset position and the searcher hook position display do not match. Without setting moment limiter to the actual searcher hook offset position, moment limiter may not work properly and thus may result in crane damage or machine tipping and could cause a serious accident.
- Depending on the boom angle, the E-boom and hook may interfere with each other, potentially leading to serious accidents. Be sure to adjust to an angle appropriate for the work.
- When hoisting a load in 1.5t searcher hook mode, raise boom to hoist the load off the ground, and stop for a while to check if the load is safe to hoist.
- When you work, never put your finger into the pin hole.

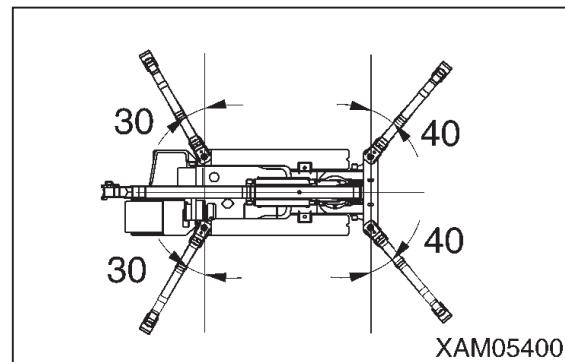
SEARCHER HOOK SAFETY PRECAUTIONS

⚠ CAUTION

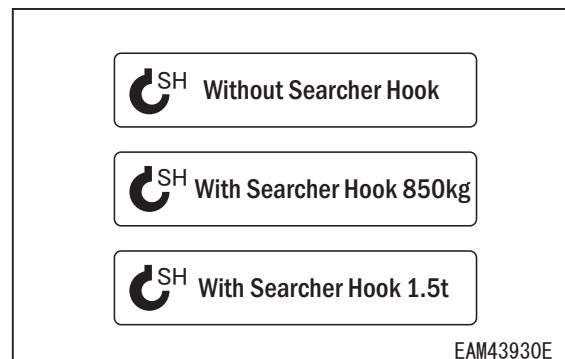
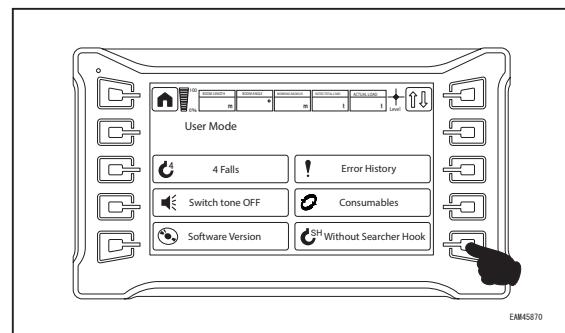
The last status of hook input and the searcher hook setting is memorised even after starter switch is turned to the OFF position.

1. Set outriggers.

See the crane operation manual for how to set the outriggers.



2. Use the searcher hook setting switch on the user mode screen and select “With Searcher Hook 1.5t”.

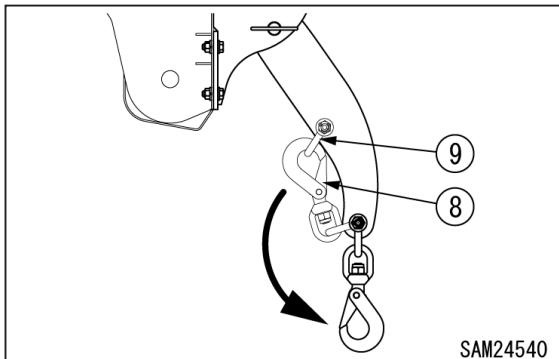


⚠ DANGER

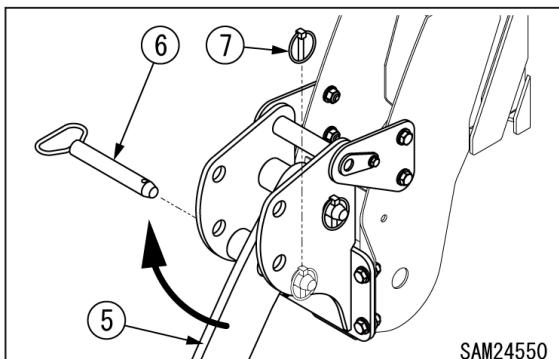
Do not use the 1.5t searcher hook unless “With Searcher Hook 1.5t” is selected.

Do not operate 1.5t searcher hook without setting moment limiter at “1.5t searcher hook mode”. Without setting in correct mode, moment limiter will not work properly, and thus may result in crane damage or a serious accident.

- Release the stored swivel hook (8) from the shackle (9).



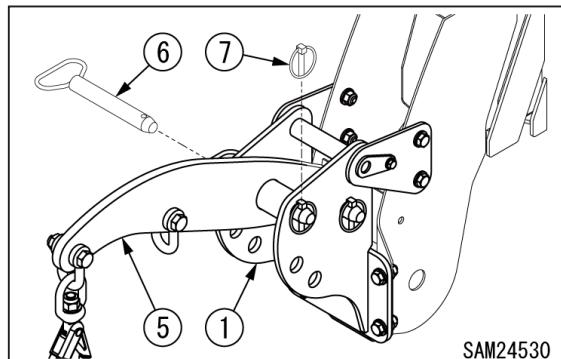
- Remove the lynch pin (7), remove the position pin (6), and change the E-boom (5) to the desired angle.



⚠ CAUTION

When pulling out the position pin (6), be sure to support the E-boom (5) with your hand.

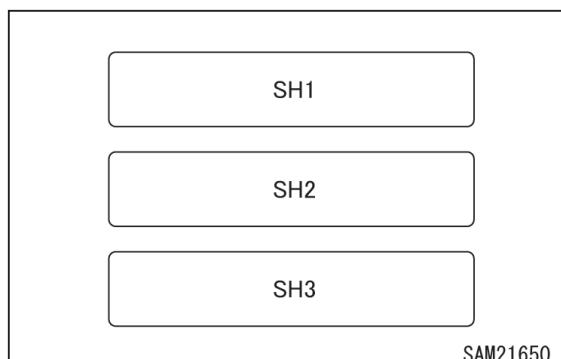
- After the position of the E-boom (5) is determined, insert the position pin (6) and fix it with the lynch pin (7).



⚠ DANGER

Always secure the position pin (6) with the lynch pin (7). If the position pin falls out during operations, serious injury or damage to the machine may result.

- Adjust the position setting on the monitor to match the actual searcher hook position.

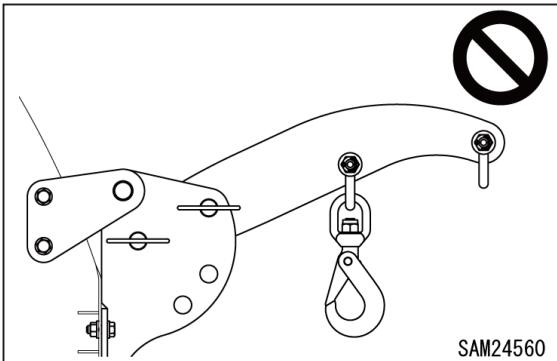


⚠ DANGER

Do not use the searcher hook if the actual position does not match the position setting on the monitor. Serious accidents such as machine damage may result because the moment limiter will not operate correctly.

⚠ CAUTION

Do not use the swivel hook with the shackle at stowage position.

**⚠ DANGER**

Strength of the shackle at stowage position is not secured. If used, there is a risk of serious accidents such as falling of the load due to E-boom breakage.

5.6.4.3 HOW TO USE THE BOOM LIFT BYPASS SWITCH

⚠ DANGER

The boom derrick function is stopped automatically when overloaded.

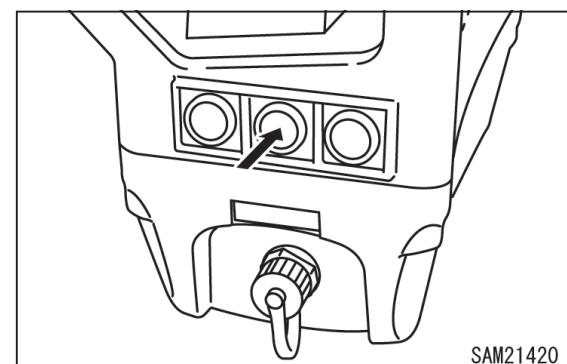
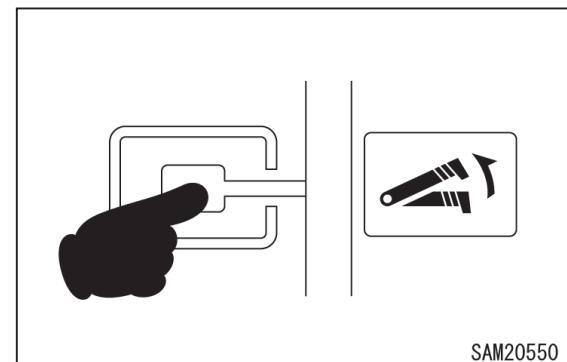
Never use this for normal lifting of loads clear of ground.

Hoisting a load off ground by using this switch may cause damage to the machine and serious accident.

In case machine is automatically stopped by entering overload area by boom lowering or boom extending operation, recover from the overload area by retracting boom, and then lower the load by boom lowering operation. If it is unavoidable to operate boom raising, the boom lift bypass switch can be used to raise the boom.

When you operate boom raising using the boom lift bypass switch, operate the boom raising while keeping the switch to ON.

When you operate boom raising using the boom lift bypass switch, operate the boom raising while keeping the switch to ON.

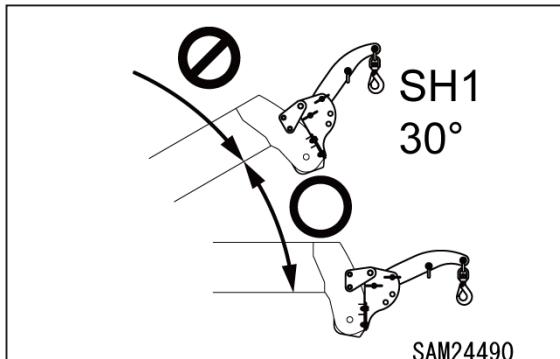


- ☞ When working envelope is set, and operation automatically stops at the boom upper angle limit or hook height upper limit, boom can be raised beyond the limit by using this boom lift bypass switch.
- Auto-stop function does not work when this switch is used after operation is stopped by working range limit setting, so please be careful.

⚠ CAUTION

E-boom and swivel hook can interfere with each other if the E-boom position is in "SH1", so boom rasing automatically stops if boom angle exceeds 30 degrees.

If you need to operate above the boom angle 30 degrees, use SH2 or SH3 position.



⚠ DANGER

- If you operate under condition that the E-Boom and swivel hook interfere with each other, it may lead to a serious accident such as dropping of a load due to breakage of the lifting accessories.
- Do not operate boom raising using the boom lift bypass switch.

5.7 FLY-JIB

5.7.1 FLY-JIB SAFETY PRECAUTIONS

- ☞ For all other safety precautions not covered in this section, refer to the section "Chapter 2 SAFETY."

5.7.1.1 PRECAUTIONS OF FLY-JIB OPERATION

⚠ WARNING

- Whenever Fly-Jib is installed, it is essential to set up outriggers (minimum outrigger extension is permitted). Failure to do so may cause a serious hazard, such as tip-over or damage to the machine.
- Whenever Fly-jib is installed, you must not travel with a hoisted load. Failure to do so may cause a serious hazard, such as tip-over or damage to the machine.
- The Fly-jib is fixed on main boom by four bolts and two position pins. The Fly-jib is a 2-stage jib. Number 1 and 2 fly-jibs are fixed by one position pin. Before crane operation, confirm two following points.
 1. Confirm the four bolts and nuts are firmly fixed.
 2. Confirm three position pins are inserted into correct positions and firmly fixed by lynch-pins.
 If a position pin or bolt comes out, it may cause the fly-jib to remove resulting in a serious hazard.
- Whenever the Fly-jib is installed, it is essential to re-connect the overwinding detector harness from the Main boom detector to the Fly-jib detector. Always ensure the overwinding detector of the

fly-jib is operational before starting work. In the event that the overwinding detector mis-functions, it may cause the hook or hoisted load to drop resulting in a serious hazard.

- Whenever using the Fly-jib, extend jib to second stage and set the moment limiter to fly-jib mode before starting operation. Before crane operation, confirm the three position pins are inserted into the correct positions and their lynch-pins are fitted. Failure to do so may cause a serious hazard, such as tip-over or damage of the machine. Failure to do so may cause a serious hazard, such as tip-over or damage to the machine.
- The fly-jib is stowed on the side of main boom and fixed by three position pins. Confirm that the three position pins are inserted into correct positions and secured by lynch-pins before you start travelling the machine. If a position pin comes out it may cause the fly-jib to drop resulting in a serious hazard.
- When the Fly-jib is stowed, always re-connect the overwinding detector harness from the Fly-jib detector to the Main boom detector. Ensure correct operation of the overwinding detector of the Main boom before starting work. In the event that the overwinding detector mis-functions, it may cause the hook or hoisted load to drop resulting in a serious hazard

5.7.2 MOMENT LIMITER FUNCTION WHEN USING FLY-JIB

⚠ DANGER

When using the fly-jib, operation is not necessarily possible across all operation ranges.

The following crane operations are prohibited within the prohibited operation area:

- Boom lowering
- Boom extension
- Hook hoisting

IMPORTANT

When the fly-jib is attached to the main boom tip, the mode changes to the fly-jib mode, and the moment limiter and the machine operate as follows:

- The rated total load value shown on the monitor switches to the value for the fly-jib.
- The number of falls is fixed at “single fall”.
- The prohibited operation area when using the fly-jib corresponds to the range in which no values are indicated in the rated total load charts. Check these together with the working radius/lifting height diagram before operating. However, boom lowering and hook hoisting are possible even within the prohibited operation area, provided all of the following conditions are satisfied:
 - Boom fully retracted
 - No load lifted

5.7.3 FLY-JIB INSTALLATION AND STOWAGE

⚠ WARNING

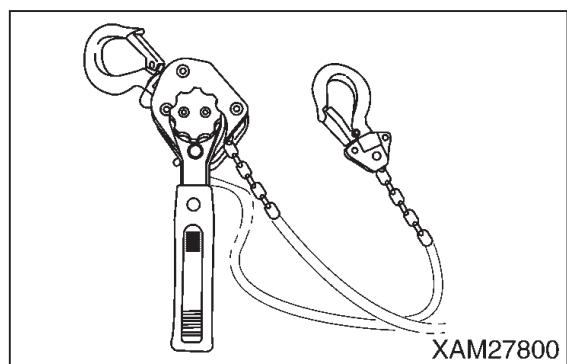
- Fly-jib installation and stowage require two trained people. Prior to erecting or dismantling operation, communication of each person's duties during the operation and the use of signals during the operation should be agreed. Where signals are not adequate, it may cause an accident and could result in injury or death.
- Fly-jib installation and stowage must be practiced on level and solid ground. Otherwise, the Fly-jib may turn due to its own weight and could cause a serious hazard.
- Fly-jib installation and stowage require a rigid stepping stool of sufficient height; an unstable stool may result in a fall from height causing an accident.
- Fly-jib installation and stowage must be undertaken after lowering the main and on firm level ground. Otherwise, the Fly-Jib may turn due to its own weight and cause a serious hazard.
- The fly-jib is fixed on the main boom by four bolts and two position pins. The fly-jib is a 2-stage jib. Number 1 and 2 sections of the fly-jib are fixed by one position pin.
Tighten four installation bolts by normal torque.
Insert three position pins into correct positions and fix with lynch-pins.
If position pin or installation bolt comes out, it may cause the fly-jib to drop resulting in a serious hazard.
- Whenever Fly-jib is installed, always extend the jib to second stage. The working radius and lifting height indication of fly-jib mode moment limiter is calculated based on the length of second stage Fly-jib.

- Whenever the Fly-jib is installed, it is essential to re-connect the overwinding detector harness from the Main boom detector to the Fly-jib detector. Also, always ensure the correct operation of the overwinding detector of the Fly-jib before starting work. In the event that the overwinding detector mis-functions, it may cause the hook or hoisted load to drop resulting in a serious hazard.
- Fly-jib is stowed the side of main boom fixed by three different length position pins.
Insert three position pins into correct position and secure using the lynch-pin. If the position pin comes out, it may cause the fly-jib to drop resulting in a serious hazard.
- When the Fly-jib is stowed, always re-connect the overwinding detector harness from the Fly-jib detector to the Main boom detector. Ensure the correct operation of the overwinding detector of the Main boom before starting work. In the event that the overwinding detector mis-functions, it may cause the hook or hoisted load to drop resulting in a serious hazard

⚠ CAUTION

A lever block is used align the bolt holes of main boom and No.1 Fly-jib and the installation and removal of the supporting rod.

For Lever Block usage, please read the attached operation manual thoroughly.



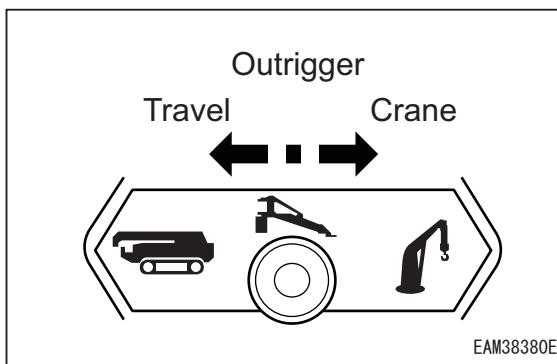
5.7.3.1 FLY-JIB INSTALLATION

⚠ WARNING

Stop the engine during operating machine. If you operate crane without stopping engine, the machine will suddenly move to resort in a serious hazard.

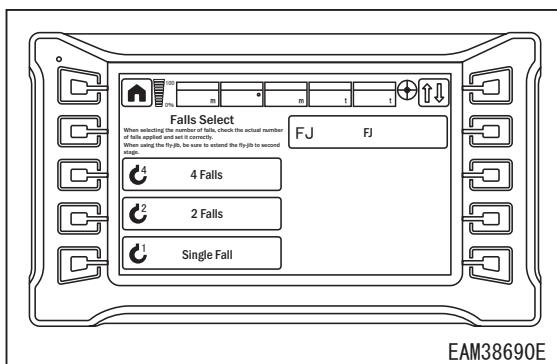
According to following instructions, install fly-jib from the left side of main boom to the head of main boom.

1. Place the crane on solid and level ground.
2. Retract main-boom to the minimum length and lower to the limit.
3. Set up outrigger, and setting switch to "crane mode".



4. Set moment limiter to "Fly-jib mode"

☞ For more information, see "4.1.8.2 [1] NUMBER OF FALLS CHANGE(1)."



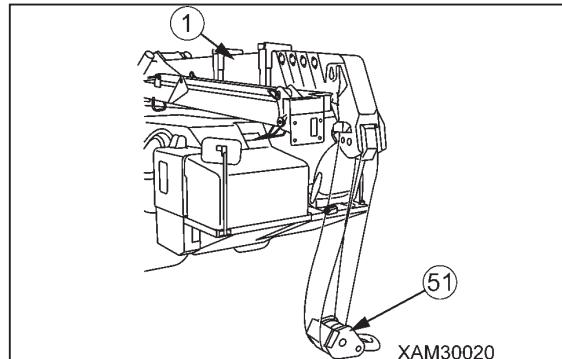
5. Follow next procedures to remove wire rope connected to hook block.

⚠ CAUTION

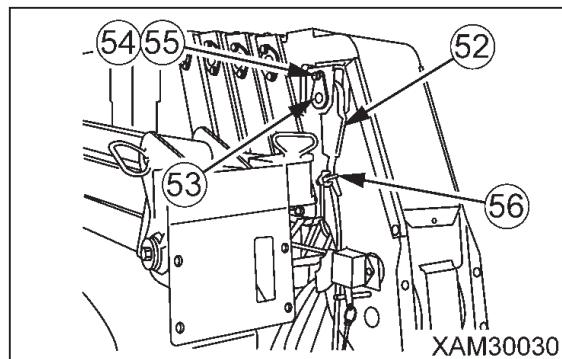
- Take care to avoid the wire rope winding randomly.

- Avoid unwinding after the hook is grounded; otherwise, it will make the wire rope wind randomly around the winch drum.

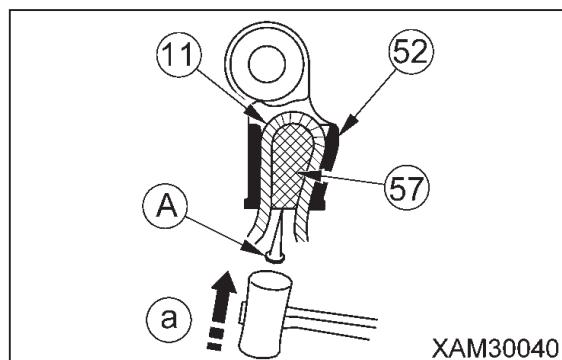
1. Raise the boom (1) to 5°, then hoist down the hook (51) so that it almost touches the ground.



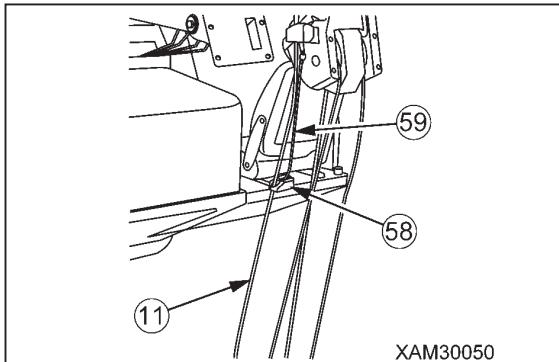
2. Press boom stowage switch to lower the boom (1) to level, and deposit hook (51) slowly on the ground.
3. Stop the engine.
4. Remove bolt (54) and pull wedge socket pin (53) out and remove wedge socket (52) from main boom.



5. Remove wire clip (56).
6. Put a bar (A) (4 - 6mm in diameter) to rope wedge (57) and hammer it to direction arrow indicates (a). Then remove wire rope (57).



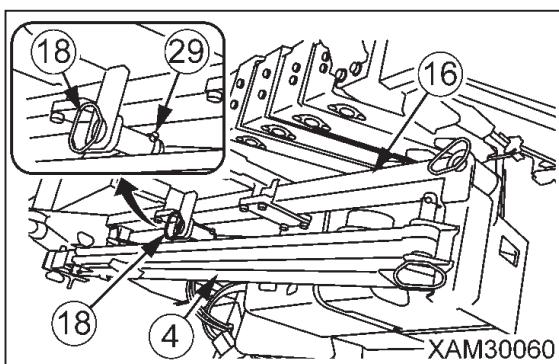
7. Remove the wire rope (11) from the hook.



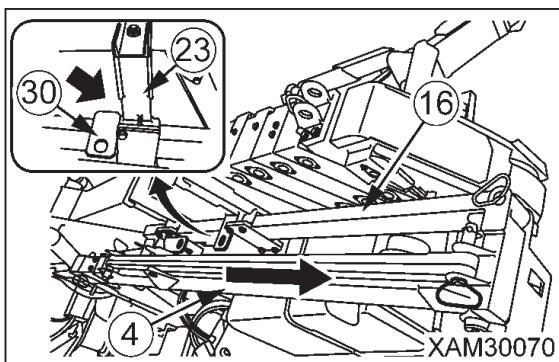
8. Remove the wire rope (11) from the overwinding detector weight (58).

9. Remove overwinding detector rope (59) and overwinding detector weight (58).

6. Pull lynch-pin (29) out from position pin (18) inserted at storage bar (16), then pull position pin (18) (length: 55mm) out from storage bar (16).

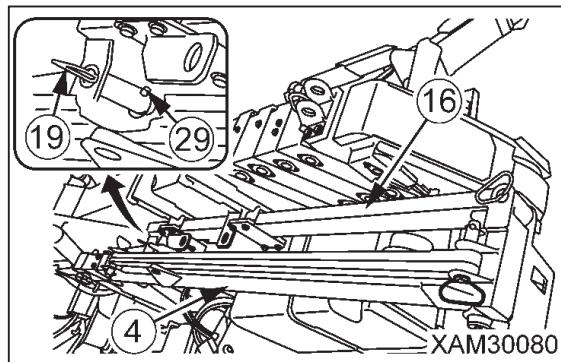


7. Slide No.1 Fly-jib (4) and storage bar (16) to head of the main boom direction.

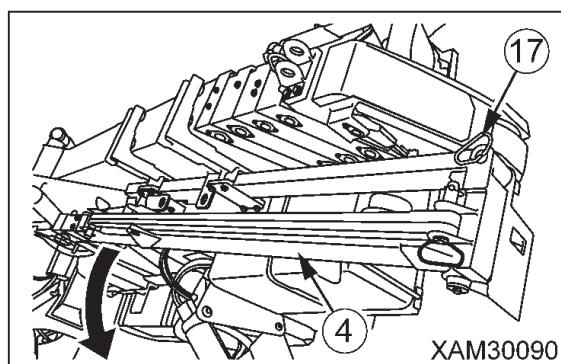


☞ Slide No.1 Fly-jib (4) and storage bar (16) until stopper (30) of storage bar (16) hit the bar guide A (23).

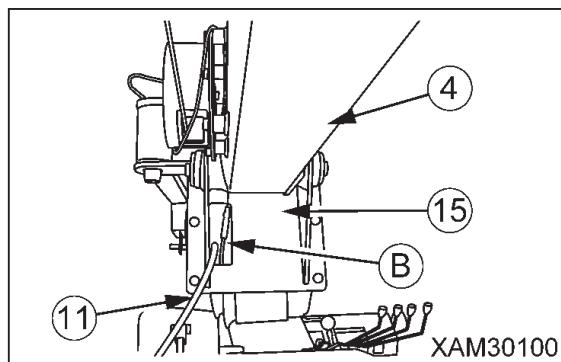
8. Pull lynch-pin (29) from position pin (19) inserted at storage bar (29), then pull position pin (19) (length: 95mm) out from storage bar (16).



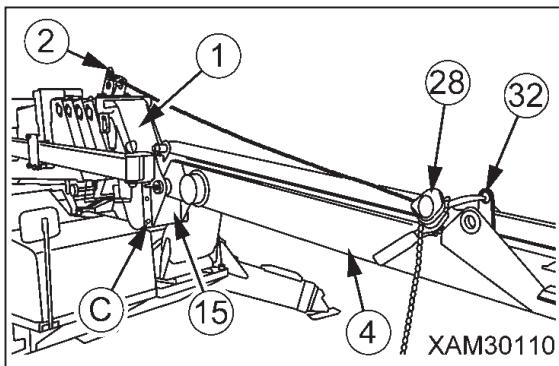
9. Lift up No.1 Fly-jib (4) tip to take it out from stow stay, then slew it around the position pin (17) (length: 150mm) on the right side of the head of main boom.



10. Lace the wire rope (11) which pulled out at section five through the hole (B) of No.1 Fly-jib bracket (15), and pull the wire rope (11) out to Fly-jib side.



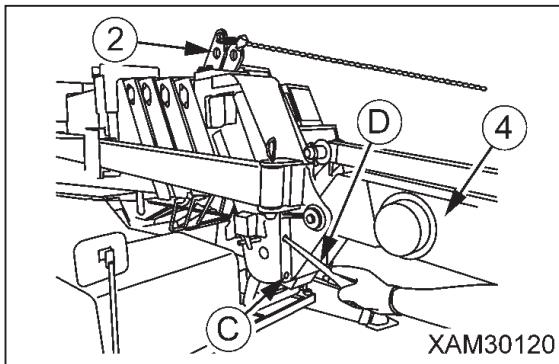
11. Hang attachment lever block (28) between No.1 Fly-jib bracket (32) and bracket (2).



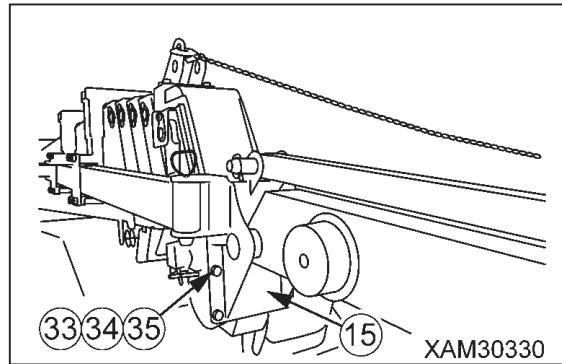
- ☞ Lever block (28) will be easy to operate to hook lever to No.1 Fly-jib bracket side.

12. Operate lever block (28) to put attachment hole of No.1 Fly-jib bracket (15) with the hole on the underneath of main boom together.

- ☞ Insert bar (D) into attachment hole (C) to put the hole (C) on No.1 Fly-jib bracket (15) and the hole on the downside of main boom.



13. Fix the No.1 Fly-jib bracket (15) and main boom by four attachment bolts (33) (M12x30L), washers (34) and nuts (35).

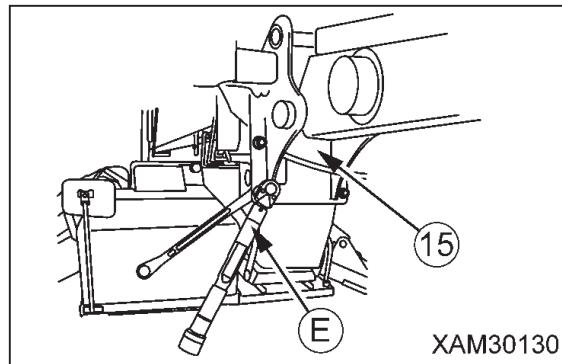


- ☞ Insert attachment bolt from main boom side.

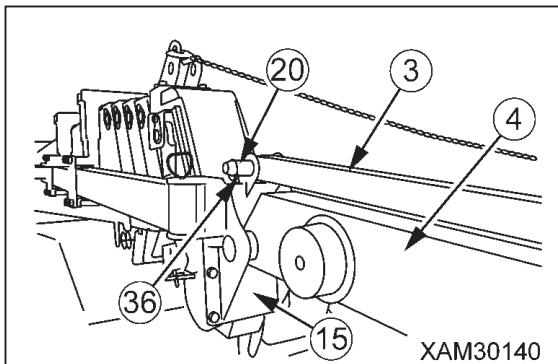
⚠ DANGER

- Use tightening torque of 93Nm to grip attachment bolt of Fly-jib. Also, use torque wrench (E) to grip attachment bolt of Fly-jib. If attachment bolt comes out, it may cause the Fly-jib to drop resulting in a serious hazard.

- Check condition of the bolts before use.

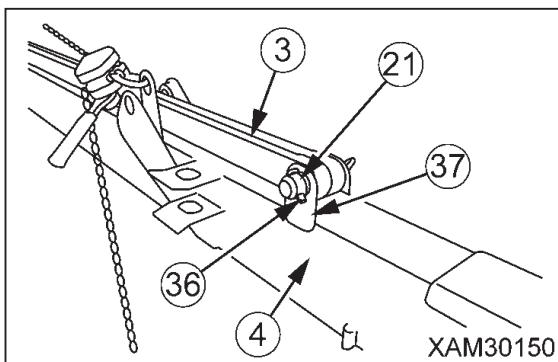


14. Pull lynch-pin (36) out from position pin (20) which fixing two supporting rod (3), then pull out position pin (20) (length: 135mm).



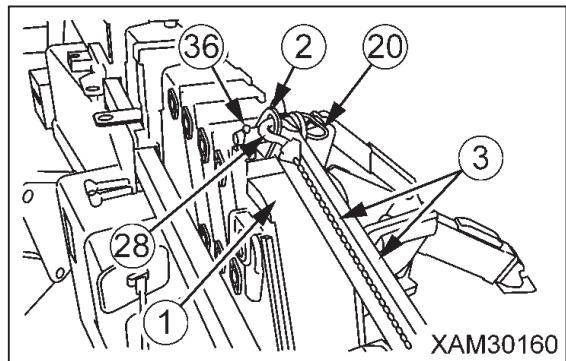
☞ The position pin (20) which you pulled out will be used later to connect supporting rod (3) with bracket on the head of main boom.

15. Pull lynch-pin (36) out from position pin (21) which fixing two supporting rods (3), then pull out position pin (21) (length: 135mm).



☞ The position pin (21) which you pulled out will be used later to connect support rod (3) with the No.1 Fly-jib bracket.

16. Move two supporting rods (3) to bracket (2) on the head of main boom and put position of the hole together.

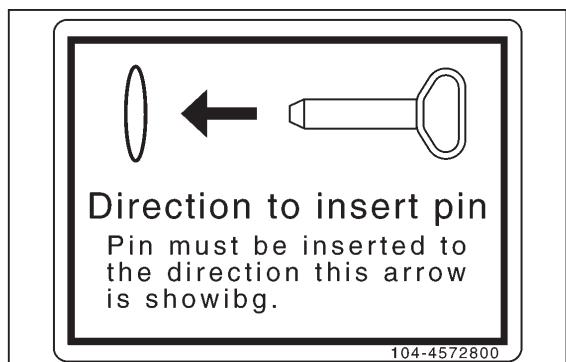


☞ Supporting rod (3) is composed of two rods. Move the rod one by one when you change the position of supporting rod (3).

17. Insert position pin (20) (length: 135mm) into bracket (2) on the head of main boom, and lock position pin (20) firmly by lynch-pin (36).

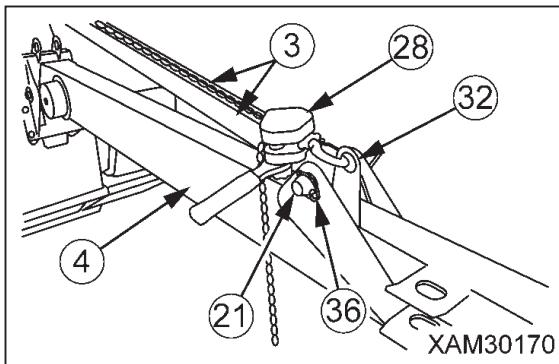
⚠ CAUTION

According to decal on the machine to insert position pin from the direction shown in the figure. If you insert position pin from opposite direction, it makes it difficult to remove supporting rod because of interference of lever block and grip of position pin.



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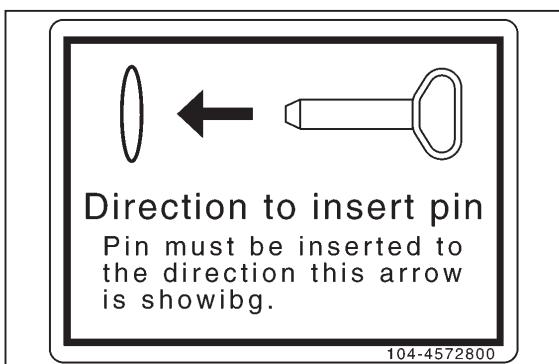
18. Operate lever block (28) to move No.1 Fly-jib (4), and put the hole position of No.1 Fly-jib bracket (32) and supporting rod (3) together.



19. Insert position pin (21) (length: 135mm) into the No.1 Fly-jib bracket (32), and lock position pin (21) firmly by lynch-pin (36).

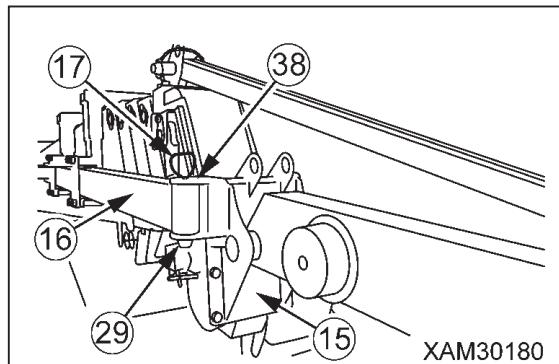
⚠ CAUTION

According to decal on the machine to insert position pin from the direction shown in the figure. If you insert position pin from opposite direction, it makes it difficult to remove supporting rod because of interference of lever block and grip of position pin.

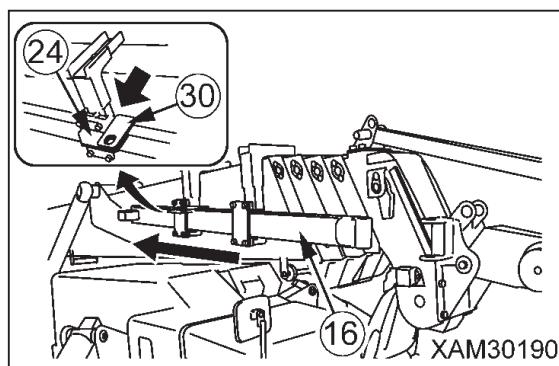


20. Remove lever block (28).

21. Pull lynch-pin (29) out from position pin (17) on the head of storage bar (16), then pull position pin (17) (length: 150mm) out from storage bar (16).

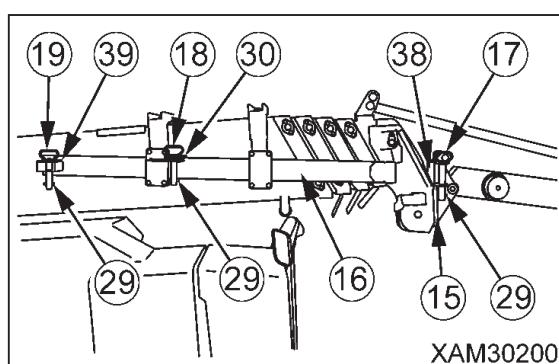


22. Slide the storage bar (16) to the back edge side of the main boom.



☞ Slide storage bar (16) until stopper (30) of storage bar (16) hit the bar guide B (24), and put the hole of stopper (30) and bar guide B (24) together.

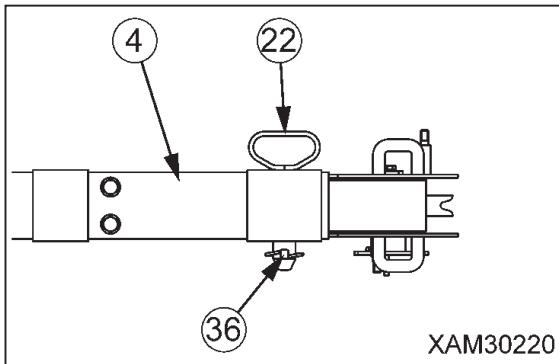
23. Insert position pin (18) (length: 55mm) into the hole of stopper (30) on the centre of storage bar (16), and lock position pin (18) firmly by lynch-pin (29).



24. Insert position pin (19) (length: 95mm) into the hole of the bracket (39) on the tail of storage bar (16), and lock position pin (19) firmly by lynch-pin (29).

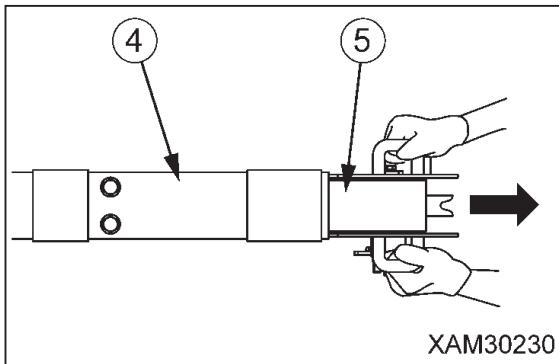
25. Insert position pin (17) (length: 150mm) into the hole of the bracket (38) of the No.1 Fly-jib bracket (15), and lock position pin (17) firmly by lynch-pin (29).

26. Pull lynch-pin (36) out from position pin (22) on the head of No.1 Fly-jib (4), then pull out position pin (22).

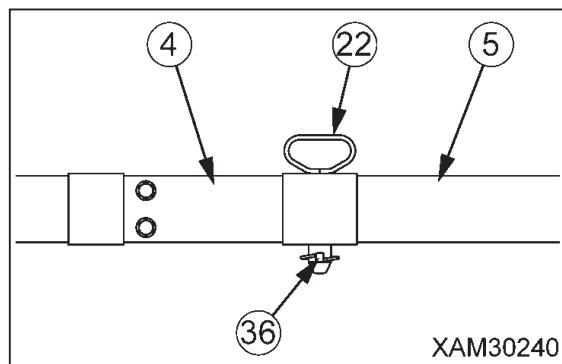


☞ Position pin (22) which pulled out is used to fix No.2 Fly-jib (5).

27. Hold handles on the both side of No.2 Fly-jib (5) to pull out No.2 Fly-jib (5).



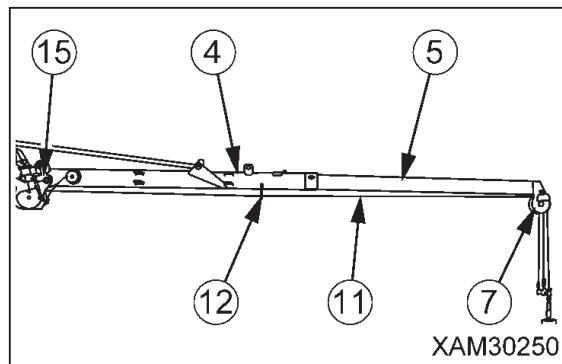
28. After pull out No.2 Fly-jib (5), put the hole together on the side of No.1 (4) and No.2 Fly-jib (5).



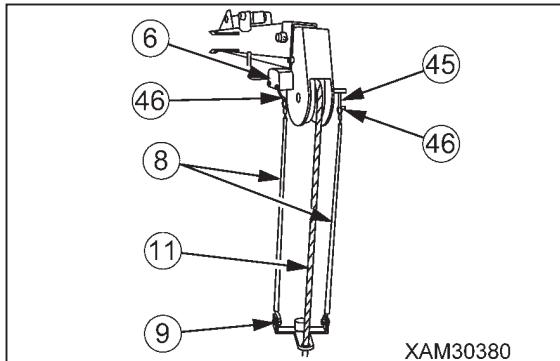
29. Insert position pin (22) into the hole on the side of No.1 Fly-jib (4), and lock position pin (22) firmly by lynch-pin (36).

30. Connect wire rope with hook block according to following point.

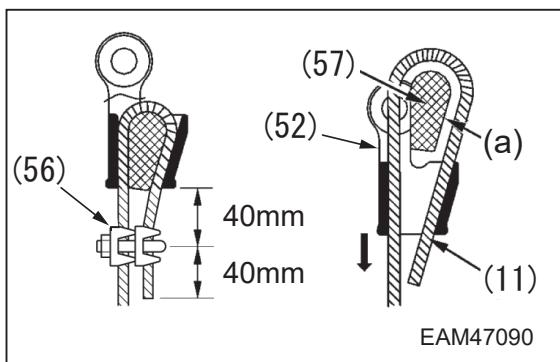
1. Lace the wire rope (11) which pulled out at section 10 through hook rack (12) on the bottom of No.1 Fly-jib (4) or guide sheave (7) on the head of No.2 Fly-jib (5).



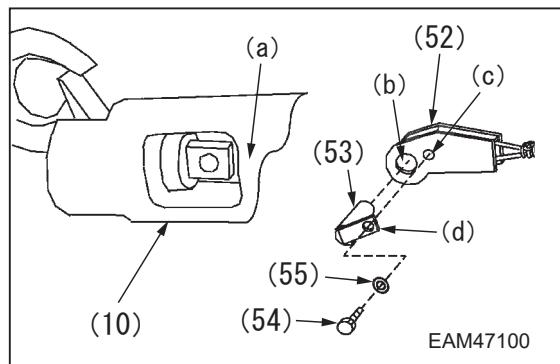
2. Use shackle (46) to attach two overwinding detector ropes (8) (length: 700mm) and weight (9) to overwinding detector (6) and plate (45) on the head of No.2 Fly-jib (5).



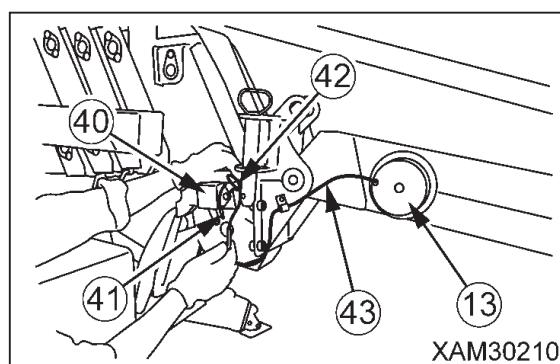
3. Lace the wire rope (11) through the hole of overwinding detector weight (9).
 4. See the figure to lace wire rope (11) through wire socket (52) removed on Step 5, and put rope wedge (57) into position (a), and pull wire rope (11) to direction which arrow indicate.



5. Attach a rope clip (56) to the wire rope (11). See the figure for details of the rope clip (56) mounting position.
 6. Hold the wire socket (52), and insert it so that the hole (b) in it aligns with the hole (a) in the pin inside the hook block. Insert the wedge socket pin (53) into the aligned holes, align the clamping hole (d) in the wedge socket pin (53) with the clamping hole (c) in the wire socket (52), then secure with the washer (55) and bolt (54).



31. Disconnect of wiring (41) of overwinding detector (40) and wiring (42) from main boom at connector, then connect wiring (42) with extension cord (43) from No.1 Fly-jib code reel (13).



☞ After connect wiring (42) with extension cord (43), push wiring into inside of main boom.

! WARNING

- Always connect wiring (42) from main boom with extension cord (43) from No.1 Fly-jib cord reel (13). If you do not change the connection of wiring, overwinding detector will not work normally and may cause the hook or load to drop resulting in a serious hazard.
- After connected extension cord (43), please confirm that wiring is not strained. If wiring is strained strongly, it will cause wiring to snap.
- Before crane operation, regularly hoist up hook to confirm whether hook will stop automatically when hook hits the overwinding detector weight.

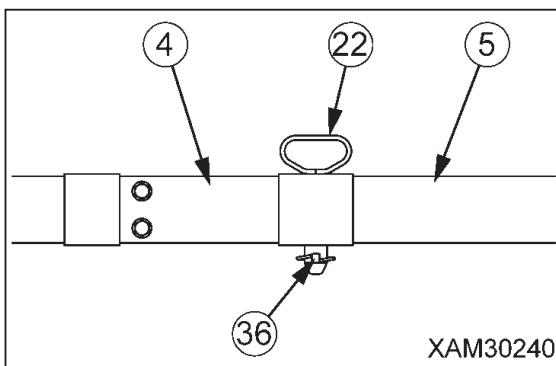
5.7.3.2 FLY-JIB STOWAGE (SINGLE FALL HOOK MODE)

⚠ WARNING

Stop the engine before stowage operation crane. If not, the crane may suddenly move and result in a serious hazard.

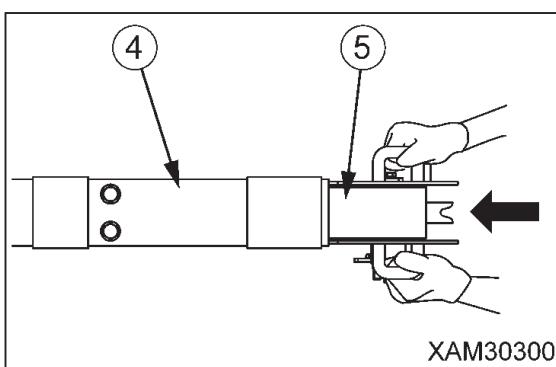
☞ This section is an explanation of method to stow fly-jib with single hook.

1. Place the crane on solid and level ground.
2. Retract main-boom to the minimum length and lower to the limit.
3. Pull lynch-pin (36) out from position pin (22) on No.1 Fly-jib (4), then pull position pin (22) out from No.1 Fly-jib (4).

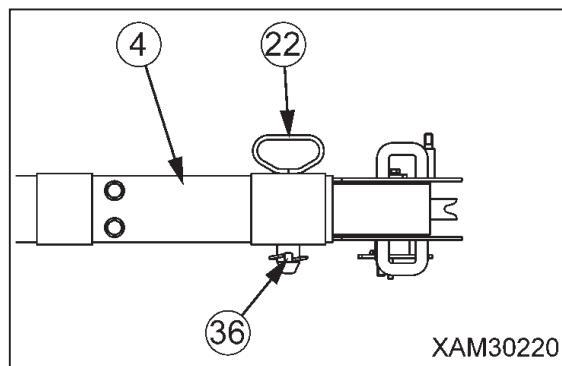


☞ The position pin (22) will be used for fixing No.2 Fly-jib (5) after retract No.2 Fly-jib (5).

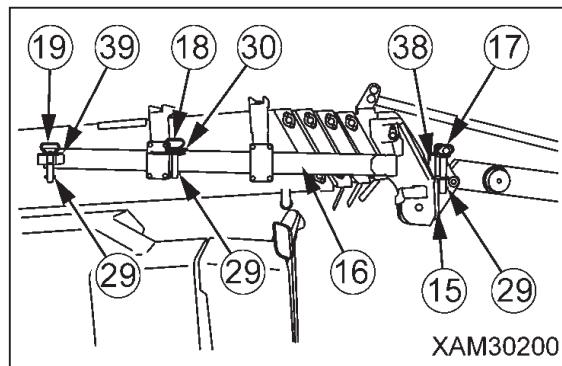
4. Hold the handle on the both side of the head of No.2 Fly-jib (5) and push No.2 Fly-jib (5) into No.1 Fly-jib (4).



5. Put the hole together on the side of No.1 Fly-jib (4) and No.2 Fly-jib (5).



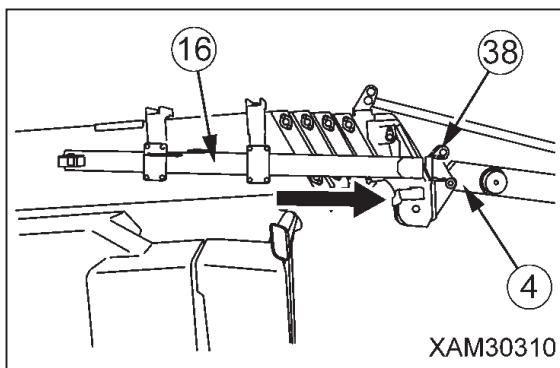
6. Insert position pin (22) and fix it firmly by lynch-pin (36).
7. Pull lynch-pin (29) out from position pin (17) inserted at the No.1 Fly-jib bracket (38), then pull position pin (17) (length: 150mm) out from the bracket (38).



8. Pull lynch-pin (29) out from position pin (18) inserted at the stopper (30) on the centre of storage bar (16), then pull the position (18) (length: 55mm) pin out from stopper (30).
9. Pull lynch-pin (29) out from position pin (19) inserted at the bracket (39) on the rear of storage bar (16), then pull the position (19) (length: 95mm) pin out from bracket (39).

☞ Position pin (17), (18), (19) pulled out on section 6, 7 will be used for storage of No.1 Fly-jib (4).

10. Slide storage bar (16) to the direction of the head of main boom.

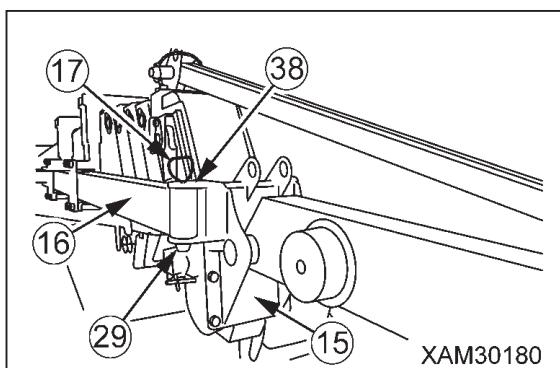


☞ Insert storage bar (16) into the head of No.1 Fly-jib bracket (38), and put position of the hole on the head of storage bar (16) and bracket (38) together

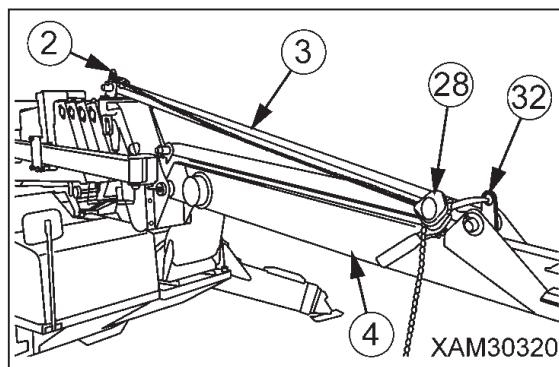
11. Insert position pin (17) (length: 150mm) into the hole on bracket (38) of No.1 Fly-jib bracket (15), then insert lynch-pin (29) into position pin (17) to fix position pin firmly.

⚠ WARNING

Always insert position pin (17) from upside. If you insert position pin (17) from downside, it will come out and result in a serious hazard.

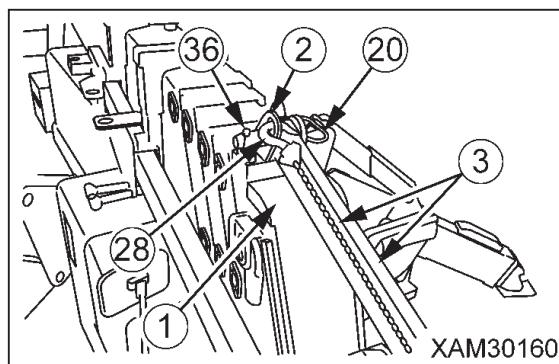


12. Hang lever block (28) between brackets (32) shown in the figure, and operate the lever block (28) to strain the chain.



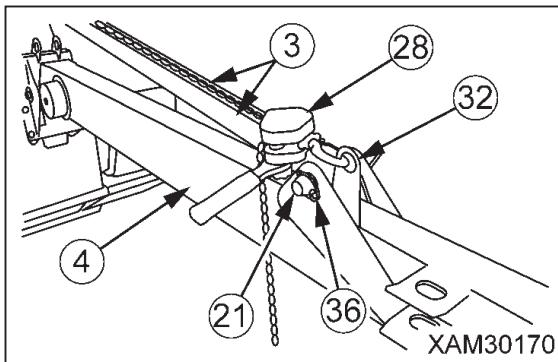
☞ Hanging lever on No.1 Fly-jib bracket (32) side makes it easy to operate lever block (28).

13. Pull lynch-pin (36) out from position pin (20) inserted at the bracket (2) of the head of main boom, then pull position pin (20) (length: 135mm) out from the bracket (2).



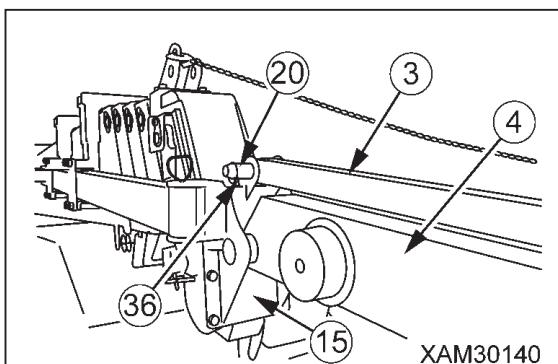
☞ Position pin (20) pulled out will be used to connect supporting rod (3) with No.1 Fly-jib bracket later.

14. Pull lynch-pin (36) out from position pin (21) inserted at the bracket (32) of No.1 Fly-jib bracket, then pull position pin (21) (length: 135mm) out from the bracket (32).



- ☞ Hold two supporting rods (3) whilst pulling position pin (21) out. If you were not hold supporting rod (3), they will drop.
- ☞ Position pin (21) pulled out will be used to connect supporting rod (3) with No.1 Fly-jib bracket later.

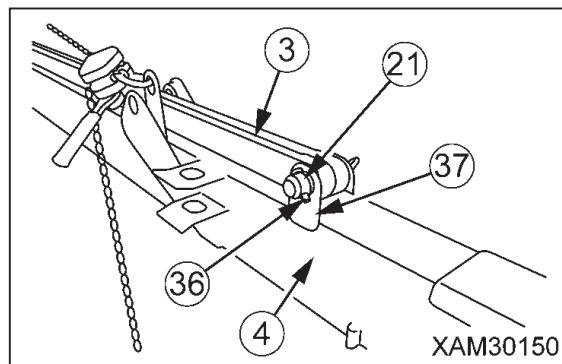
15. Insert two supporting rods (3) into upside of No.1 Fly-jib bracket (15), and put positions of the hole together.



16. Insert position pin (20) (length: 135mm) into the hole on the upside of No.1 Fly-jib bracket (15), and lock position pin (20) firmly by lynch-pin (36).

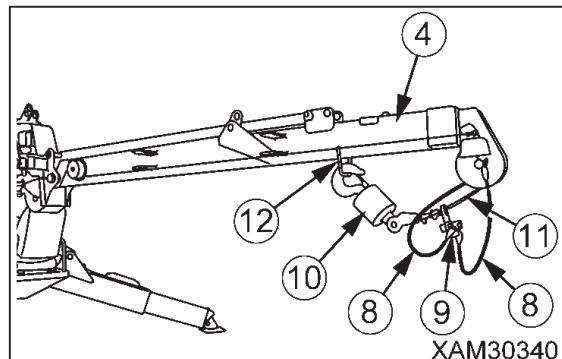
- ☞ Supporting rod (3) is composed of two rods. Move the rod one by one when you change the position of supporting rod (3).

17. Operate lever block (28) to move No.1 Fly-jib (4), and put the hole of supporting rod (3) and No.1 Fly-jib (4) bracket (37) together.



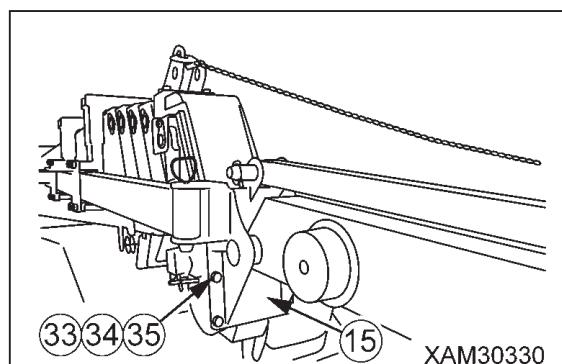
18. Insert position pin (21) (length: 135mm) into the hole of No.1 Fly-jib (4) bracket (37), then fix position pin (21) firmly by lynch-pin (36).

19. Hang single fall hook (10) on the hook holder (12) underneath the No.1 Fly-jib (4).



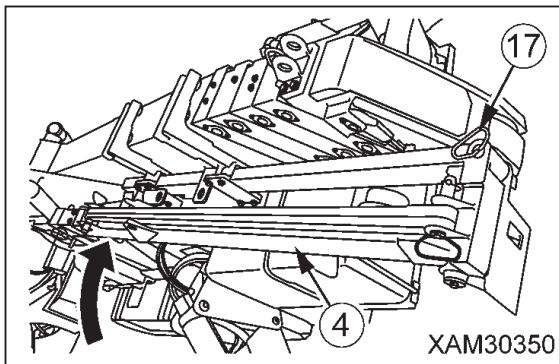
- ☞ Slacken off wire rope (11) slightly.

20. Remove four attachment bolts (33) (M12x30L), four washers (34), and four nuts (35) which are used on the No.1 Fly-jib bracket (15).

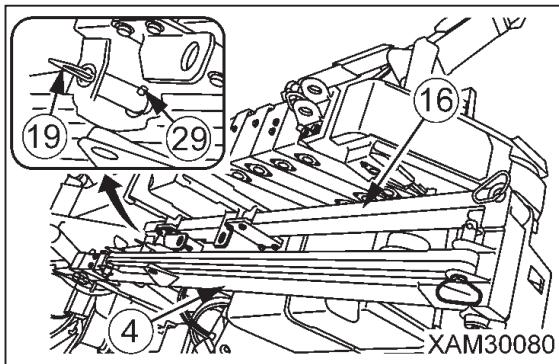


21. Remove lever block (28).

22. Lift up No.1 Fly-jib (4) tip to take it out from stow stay, then slew it around the position pin (17) (length: 150mm) on the right side of the head of main boom.



23. Put the hole of storage bar (16) and bracket on the head of No.1 Fly-jib (4) together.

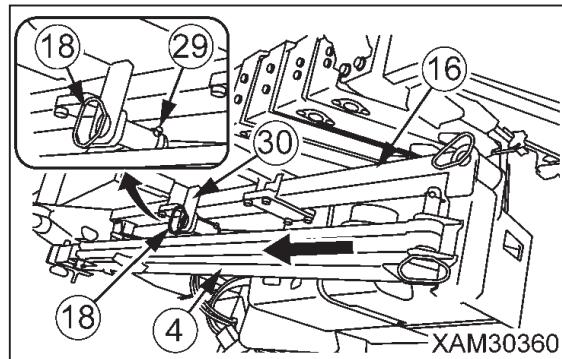


24. Insert position pin (19) into the hole of No.1 Fly-jib (4) bracket, then fix position pin (19) firmly with lynch-pin (29).

⚠ WARNING

Always insert position pin (19) from upside. If you insert it from downside, position pin will come out and result in a serious hazard.

25. Slide storage bar (16) and No.1 Fly-jib (4) to the direction of the head of No.1 Fly-jib (4), put the hole of the stopper (30) on the storage bar (16) and No.1 Fly-jib (4) together.

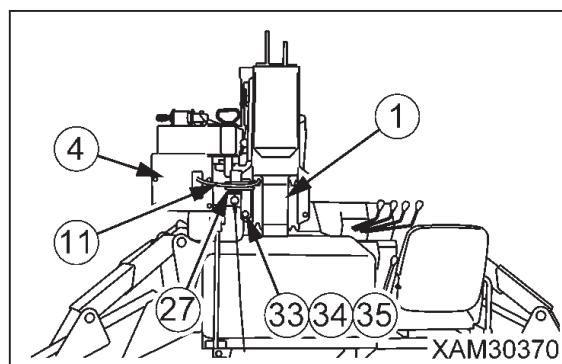


26. Insert position pin (18) into the hole of stopper (30) on the storage bar (16), then fix position pin (18) firmly by lynch-pin (29).

⚠ WARNING

Always insert position pin (18) from upside. If you insert it from downside, position pin will come out and result in a serious hazard.

27. Set the sheave (27) for Fly-jib stowing to the hole on the head of main boom, and fix by attachment bolt (33) (M12x30L), washer (34), and nut (35).

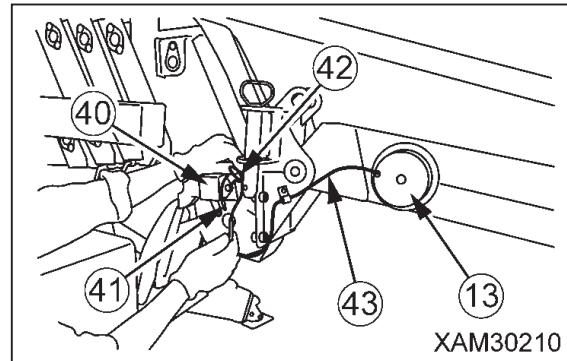


28. Hang wire rope (11) on the sheave (27) of Fly-jib stowing.

CAUTION

If you are to stow No.1 Fly-jib with single fall hook, always attach sheave (27) for Fly-jib stowing, and hang wire rope (11) from main boom to this sheave (27). If you do not use this sheave (27), the wire rope (11) will bend and result in early damage of wire rope.

- Before crane operation, always hoist up hook to confirm whether hook will stop automatically when hook hits the overwinding detector weight.



5.7.3.3 CHANGE TO SINGLE FALL HOOK FROM MAIN-BOOM HOOK BLOCK

⚠ WARNING

Always stop the engine during changing of hook block. If you work without stopping the engine, machine may suddenly move to result in a serious hazard.

☞ This section is the explanation of the method to change single fall hook block for regular hook block after stowing Fly-jib.

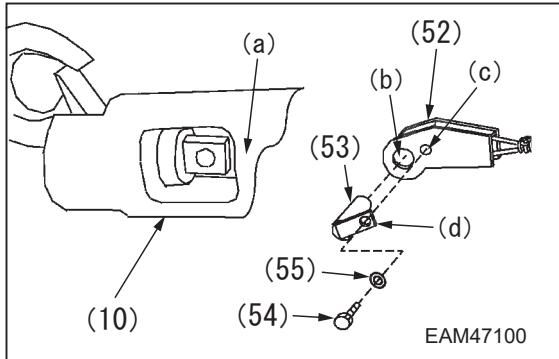
1. Disconnect wiring (42) from main boom and extension cord (43) from No.1 Fly-jib cord reel (13) at connector, then connect wiring (42) with wiring (41) from overwinding detector (40).

⚠ WARNING

- Always connect wiring (42) from main boom with wiring (41) from overwinding detector (40). Without changing connection of wiring, overwinding detector will not work and may drop the hook or load, and result in a serious hazard.

2. Remove single fall hook according to following information.

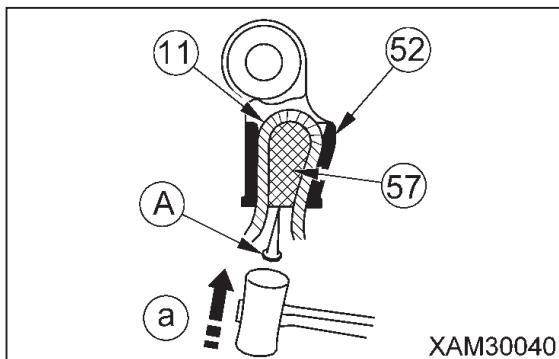
1. Press boom stowage switch to lower boom to level, and deposit single fall hook (10) slowly on the ground.



2. Remove the bolt (54) and washer (55) to pull out the wedge socket pin (53) and remove the wedge socket (52) from the single hook (10).

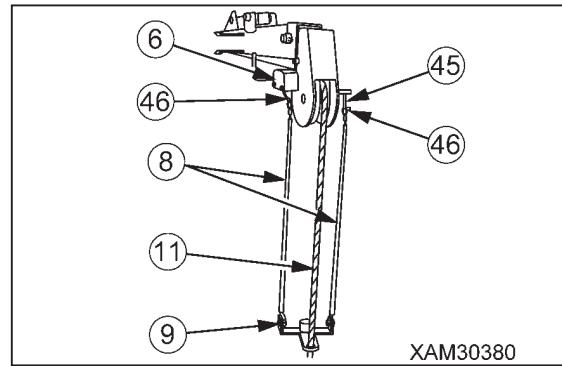
3. Remove the wire clip (56).

4. Remove the rope wedge (57) from the wedge socket (52) by lightly tapping with a hammer in the direction indicated by the arrow (a) on a 4 mm to 6 mm diameter round bar (A) placed against the rope wedge (41), and then remove the wire rope (11).



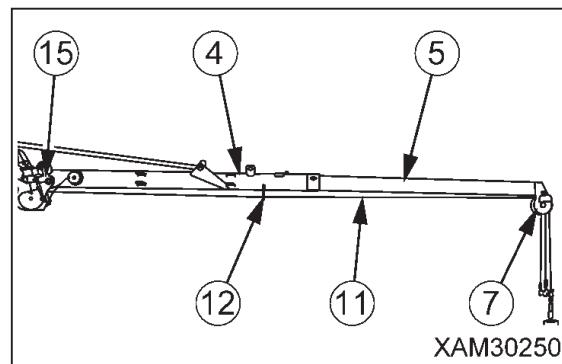
5. Remove wire rope (11) from rope wedge (52).

6. Pull wire rope (11) out from weight (9) of overwinding detector (6).

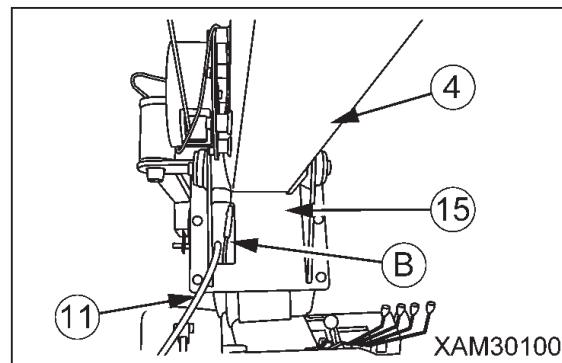


7. Remove protective rope (8) and protective weight (9).

3. Pull wire rope out (11) from guide sheave (7) on the head of No.2 Fly-jib (5) and hook holder (12) on the underneath of No.1 Fly-jib (4).



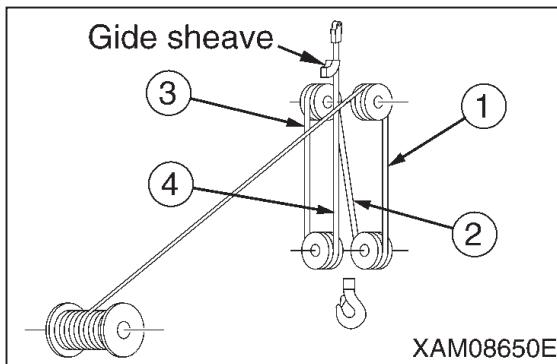
4. Put wire rope (11) out from the hole (B) of No.1 Fly-jib bracket (15) to main boom side.



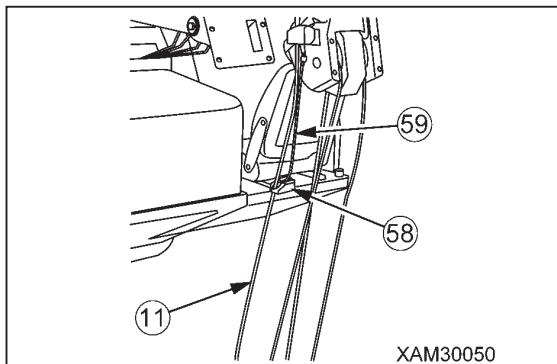
5. See "5.7.3.2 FLY-JIB STOWAGE (SINGLE FALL HOOK MODE)" and stow Fly-jib.

6. The following information is to attach the wire rope to 4 fall hook block.

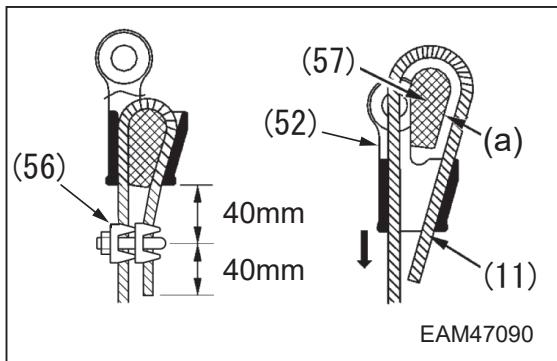
1. Take up wire rope to winch operation
2. Accommodate the type of hook block (single to 4 fall hook), lace wire rope to load sheave, hook block sheave and guide sheave as shown in the figure.



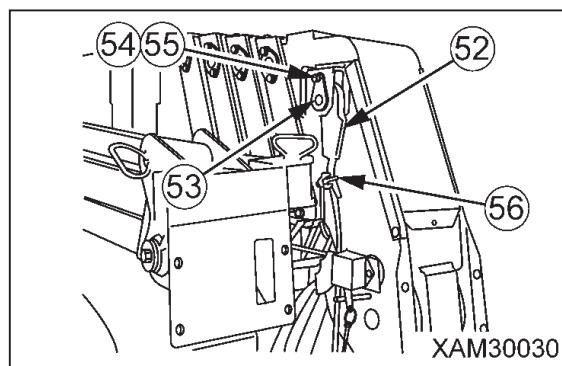
3. Lace wire rope (11) into the weight (58) of overwinding detector.



4. Insert wire rope (11) with rope wedge (57) into wire socket (a) position, then pull wire rope (11) to the direction the arrow is showing.



5. Attach wire clip (56) to the wire rope (11).



6. Set the wedge socket (52) and insert wedge socket pin (53) into it, and fix firmly by one bolt (54) (M8x12L) and one washer(55).

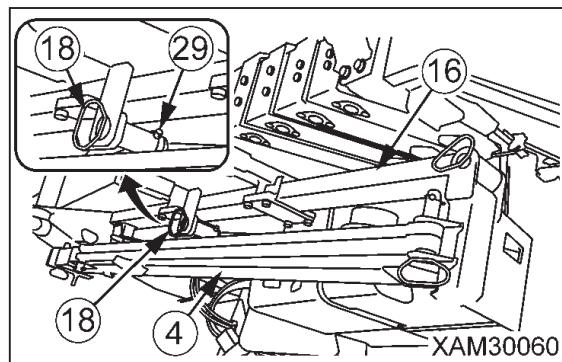
5.7.3.4 REMOVAL OF FLY-JIB ASSEMBLY

⚠ WARNING

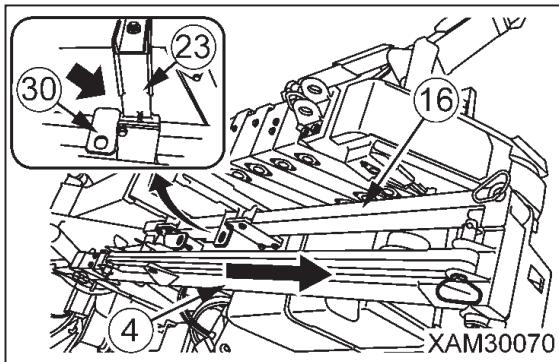
- Always stop the engine regularly during changing hook block. If you work without stopping engine, machine may suddenly move resulting in a serious hazard.
- The hoisting attachments such as wire rope and shackle used in hoisting shall be sufficiently strong for the weight of Fly-jib

☞ This section is an explanation of the method to remove Fly-jib from machine. Use crane to remove Fly-jib.

1. Pull lynch-pin (29) out from position pin (18) inserted at storage bar (16), then pull out position pin (18) (length: 55mm).

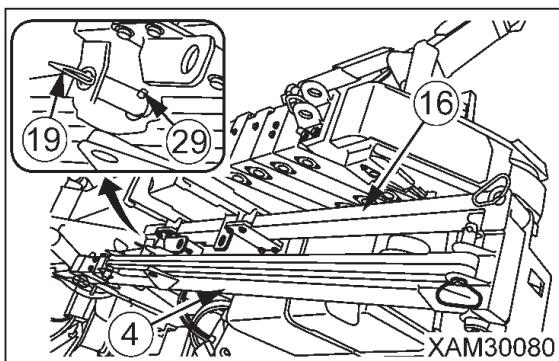


2. Move No.1 Fly-jib (4) and storage bar (16) to the direction of head of the main boom.

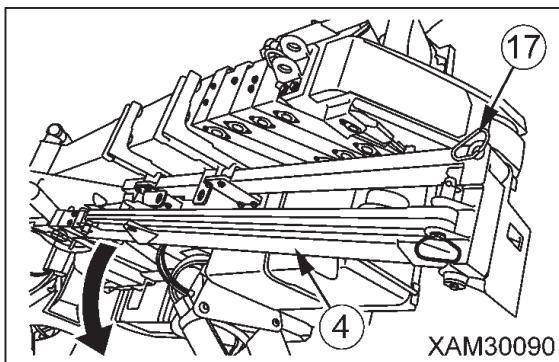


☞ Move No.1 Fly-jib (4) and storage bar (16) until stopper (30) of the storage bar (16) has hit bar guide A (23).

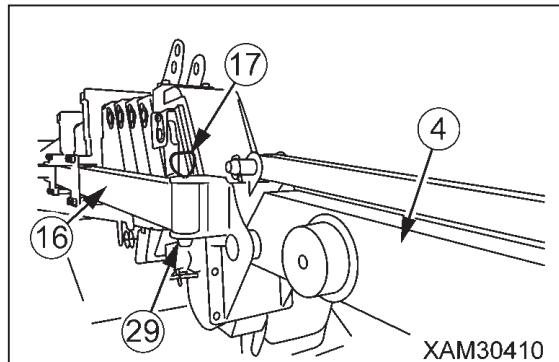
3. Pull lynch-pin (29) out from position pin (19) inserted at storage bar (16), then pull out position pin (19) (length: 95mm).



4. Lift up No.1 Fly-jib (4) tip to take it out from stow stay, then slew it around the position pin (17) (length: 150mm) on the right side of the head of main boom.



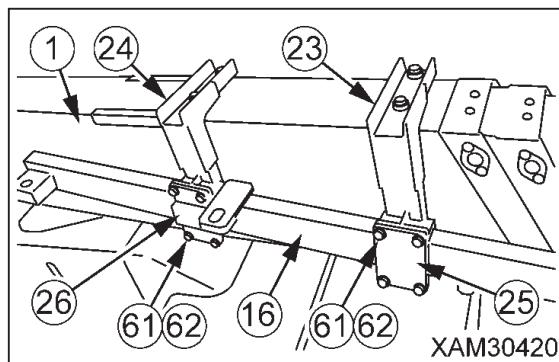
5. Hang hoisting wire rope to No.1 Fly-jib (4), and hoist the jib interim.



6. Pull lynch-pin (29) out from position pin (17) inserted at storage bar (16), then pull out position pin (17) (length: 150mm).

7. Hoist No.1 Fly-jib (4) and remove it.

8. Take off four attachment bolts (61) and four washers (62) from bar guide D (26), then remove bar guide D (26).



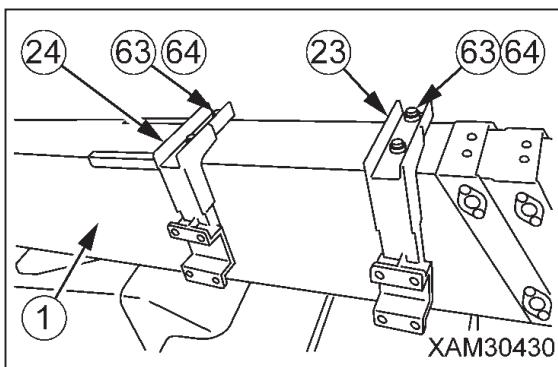
9. Take off four attachment bolts (61) and four washers (62) from bar guide C (25), then remove bar guide C (25).

⚠ WARNING

Hold the storage bar (16) firmly when you remove bar guide C (25). Storage bar (16) will fall down, after removing bar guide C (25).

10. Remove storage bar (16).

11. Take off two attachment bolts (63) and washers (64) from bar guide A (23), then remove bar guide A (23)



12. Take off two attachment bolts (63) and washers (64) from bar guide B (24), then remove bar guide B (24).

⚠ CAUTION

- Record the number of washer (64) when you remove bar guide (23), (24). Refer it to attach storage bar again.
- Washer on each bar guide attachment bolt.
- Washer on each bar guide and between main booms.

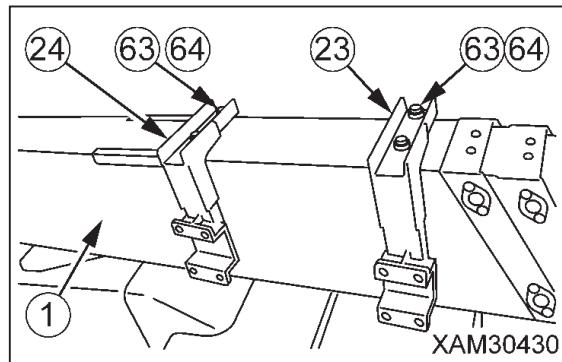
5.7.3.5 INSTALLATION OF FLY-JIB ASSEMBLY

⚠ WARNING

- Always stop the engine during changing of hook block. If you work without stopping engine, the machine may suddenly move and result in a serious hazard.
- The hoisting attachments such as wire rope and shackle used in hoisting shall be sufficiently strong for the weight of Fly-jib.

This section is an explanation of Fly-jib attachment to the machine. Use crane to attach Fly-jib.

1. Set the bar guide B (24) to regular position on the main boom, then tighten it by two attachment bolts (63) and plural washers (64).



2. Set the bar guide A (23) to regular position on the main boom, then tighten it lightly by two attachment bolts (63) and plural washers (64).

⚠ CAUTION

If you attach bar guide A (23) to machine, replace washers (64) to each part with the same number of washers as recorded when you removed it.

- Washer on each bar guide and attachment bolt.
- Washer on each bar guide and between main booms.

When you attach new Fly-jib, use number of washers (64) as directed below, and set Bar guide A (23) of Stowage Bar so that it faces slightly upper side.

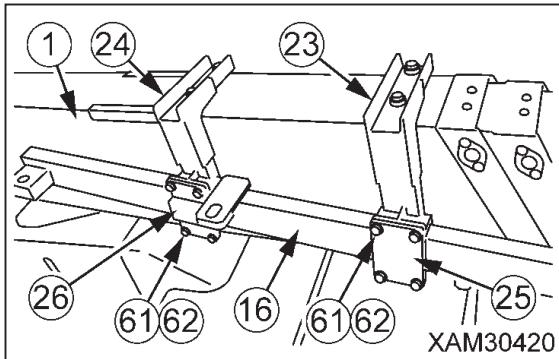
- Use washer one by one to each attachment bolt on bar guide.
- Use washer one by one to bar guide A (23) and between main booms.
- Do not use washer for bar guide B (24) and between main boom.

When you attach bar guide A (23), tighten attachment bolt lightly. It is necessary to remove attachment bolt (63) again because of regulating storage bar height.

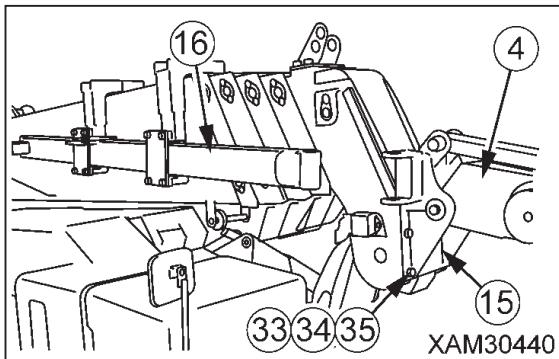
3. Push storage bar (16) into bar guide A (23) and bar guide B (24).

⚠ WARNING

Hold storage bar (16) firmly, until bar guide C (25) is attached.

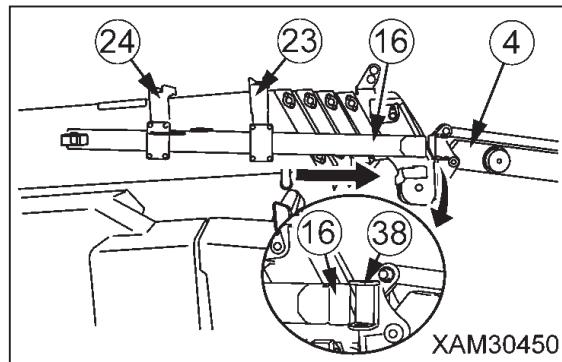


- Set bar guide C (25) into bar guide A (23), and tighten it by four attachment bolts (61)
- Set bar guide D (26) into bar guide B (24), and tighten it by four attachment bolts (61) and plural washers (62).
- Hang wire rope to No.1 Fly-jib (4), then operate crane to set No.1 Fly-jib (4) to Fly-jib bracket (15) on the head of main boom.



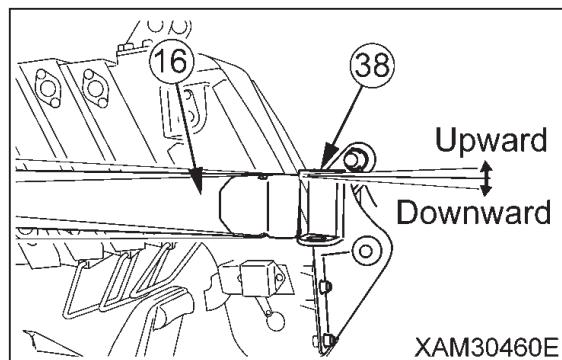
- Use four attachment bolt (33) (M12x30L), four washers (34) and four nuts (35) to tighten attach Fly-jib bracket (15) with main boom.
- ☞ Insert attachment bolt from main boom side.

- Move storage bar (16) to No.1 Fly-jib (4) side, and confirm whether storage bar (16) could be inserted smoothly into N0.1 Fly-jib bracket (38).



⚠ CAUTION

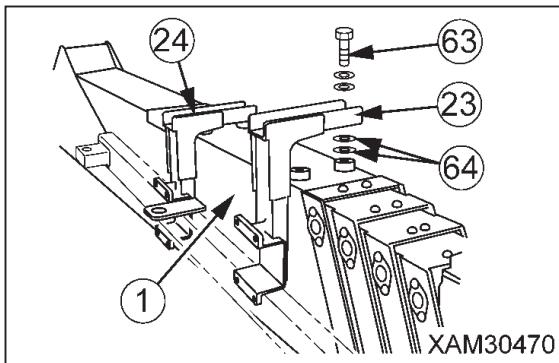
In case the storage bar (16) was not to insert smoothly into No.1 Fly-jib bracket (38), confirm condition. After confirmation, if there is something wrong with storage bar, reset bar in accordance with "METHOD to REGULATE THE HEIGHT of STORAGE BAR" to re-set it.



- In case storage bar (16) faced to upper side toward bracket (38), it indicates that bar guide A (23) is on a higher position than bar guide B (24).
- In case storage bar (16) face to downwards toward bracket (38), it indicates that bar guide A (23) is on a lower position than bar guide B (24).

[METHOD to REGULATE THE HEIGHT of STORAGE BAR]

Basically, adjust the number of washers on bar guide side A (23) to regulate the height of storage bar (16).

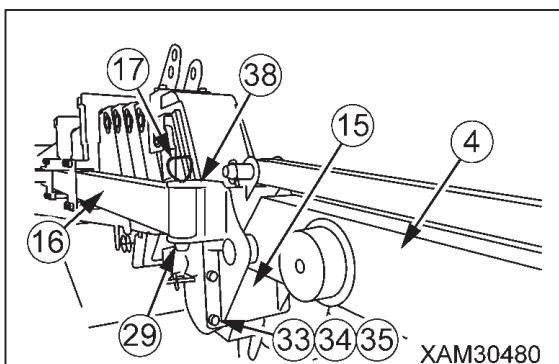


1. After confirmation, in the case applicable to the above section 1, remove attachment bolt (63) on the bar guide A (23) side, reduce the number of washers (64) between main boom (1) and bar guide A (23).

2. After confirmation, in the case applicable to the above section 2, remove attachment bolt (63) on the bar guide A (23) side, increase the number of washers (64) between main boom (1) and bar guide A (23).

9. Tighten two attachment bolts (63) and plural washers (64) on bar guide A (23).

10. Insert storage bar (16) into bracket (38) to put the hole position together.



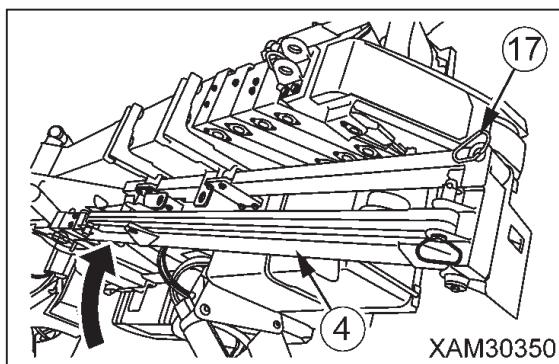
11. Insert position pin (17) into bracket (38), then fix position pin (17) (length: 150mm) firmly by lynch-pin (29).

⚠ WARNING

Always insert position pin (17) from upper side. If you insert it from underside, position pin (17) can drop out resulting in a serious hazard.

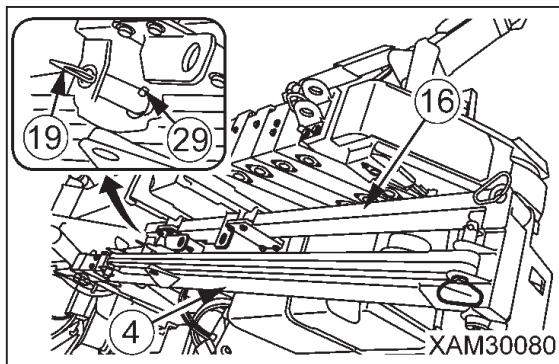
12. Remove four attachment bolts (33) (M12x30L), four washers (34) and four nuts (35) from Fly-jib bracket (15).

13. Operate crane to lower the hook, then remove No.1 Fly-jib (4) hanging wire rope.



14. Lift up No.1 Fly-jib (4) tip to take it out from stow stay, then slew it around the position pin (17) (length: 150mm) to the main boom side.

15. Put the hole on storage bar (16) and bracket on the head of No.1 Fly-jib (4) together.

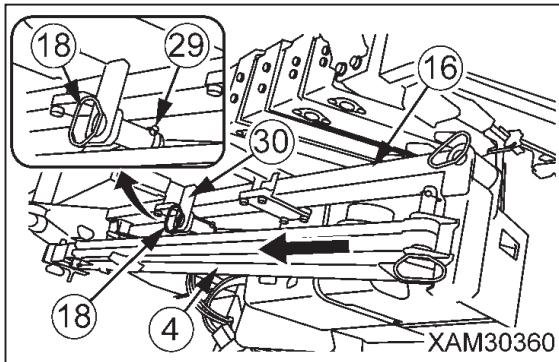


16. Insert position pin (19) into the hole on the bracket on the head of No.1 Fly-jib (4), then fix position pin (19) securely with the lynch-pin (29).

⚠ WARNING

Always insert position pin (19) from upper side. If you insert position pin (19) from under side, it will drop out resulting in a serious hazard.

17. Slide No.1 Fly-jib (4) and storage bar (16) to the head of No.1 Fly-jib (4), then put the hole on stopper (30) of storage bar (16) and No.1 Fly-jib (4) together.



18. Insert position pin (18) into the hole on the stopper (30) of storage bar (16), then fix position pin (18) securely with the lynch-pin (29).

⚠ WARNING

Always insert position pin (18) from upper side. If you insert position pin (18) from under side, it will drop out resulting in a serious hazard.

5.7.4 OPERATIONS

⚠ DANGER

- For safety, always turn the operation mode of moment limiter to fly-jib operation, prior to starting its operation. Operation in improper mode may cause a serious accident such as tipping.
- Whenever Fly-jib is installed, always extend the jib to second stage. The working radius and lifting height indication of fly-jib mode moment limiter is calculated based on the length of second stage Fly-jib.
- Pick and carry by fly-jib is strictly prohibited since it will result in a serious hazard such as tipping or machine damage.

The fly-jib is operated in the same way as the crane operation of the machine itself.

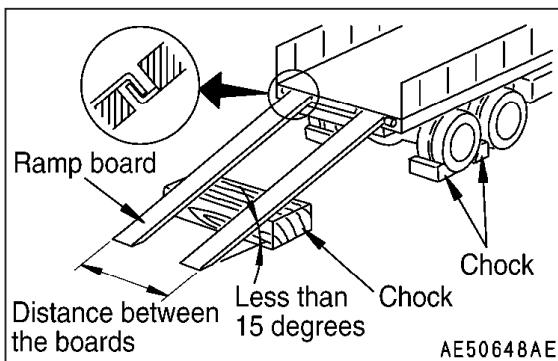
5.8 TRANSPORTATION

Observe the related laws and regulations and transport the machine safely.

5.8.1 TRANSPORT PRECAUTIONS

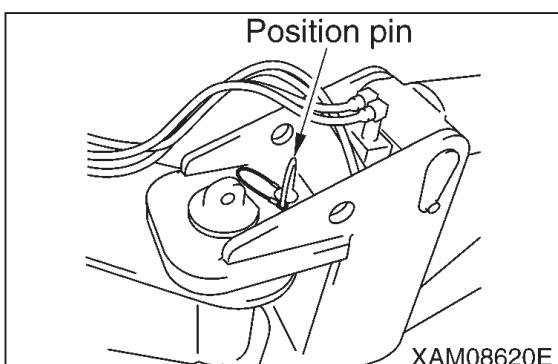
CAUTIONS WHEN LOADING OR UNLOADING

- Be especially careful when loading or unloading the machine because the risks intervene.
- Select a location that is level and has firm road surface when loading or unloading the machine. In addition, keep enough distance from the roadside.
- Use the ramps under 15 degrees or smaller angle. In addition, decide the clearance between ramps to meet the centre of the rubber tracks.

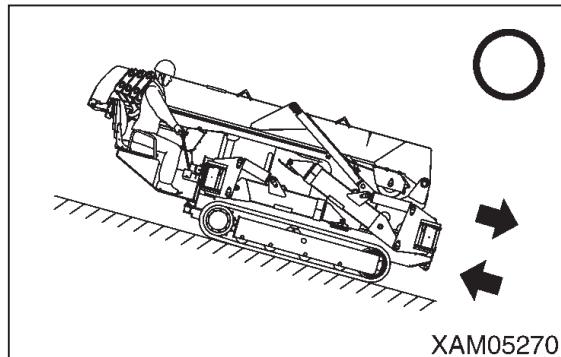


- Always set the machine in the "travelling posture" and securely insert the position pins (4 pieces) to the outrigger rotary parts before loading or unloading the machine.

For more information, see
"5.2.5 TRAVELLING POSTURE".



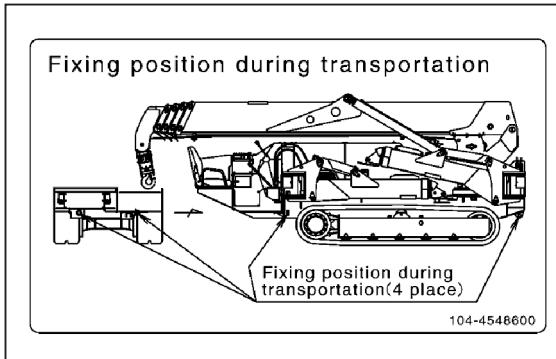
- Always move backward when loading the machine. Travelling forward may cause a trip.



- When loading or unloading, set the engine rotation to low idling (low speed rotation) and operate slowly by low speed travels.
- Use the ramps that have fully strong width, length and thickness, and that enable safe loading/unloading. Reinforce with blocks or other substances if the ramps deflect much.
- Remove the mud and other substances from the footing to prevent the machine from skidding over the ramps. Remove the substances stuck the ramps such as grease, oil or ice, and keep clean. Be especially careful in the rainy days where slips easily occur.
- Do not change direction over a ramp. Temporarily leave the ramp before correcting the direction.
- Be slow when operating to change the direction on the truck platform where the footing is unstable.

- After loading the machine, apply the wood blocks so that the machine does not move, and securely fix with wire ropes or other means.

For more information, see “5.8.5 CAUTIONS DURING TRANSPORTATION” and “5.8.4 CAUTIONS ON LOADING MACHINE”.



CAUTIONS DURING TRANSPORT

Observe the related regulations and exercise safety during transport.

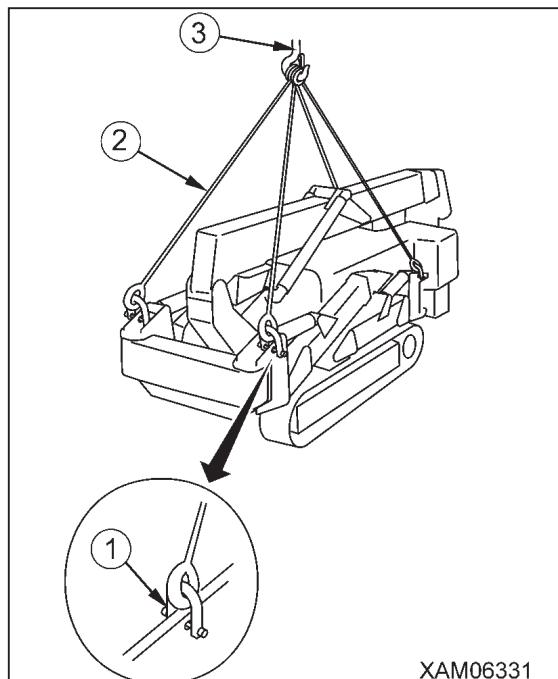
CAUTIONS WHEN LOADING/UNLOADING WITH CRANE

Be careful of the followings when loading or unloading the machine by hoisting with a crane.

- Do not use those brackets on the boom to hang the whole unit.
- Before hoisting the machine, attach the hoisting brackets (1) (for instance shackles) to the outrigger rotary holes (four), and hang the wire ropes (2) (four) on the hook (3).

- To hoist, use the crane, wire ropes (2) and hoisting bracket (1) (for instance shackles) having enough strength against the machine mass (weight).

Following is the load force that applies to each of the wire ropes when the machine main body is hoisted by four wire ropes. Standard specification: 1400kg

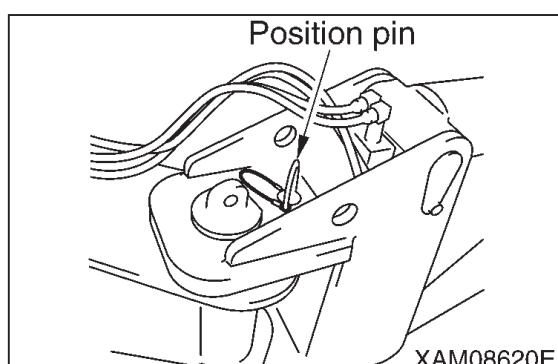


- Always set the machine in the “travelling posture” and securely insert the position pins (4 pieces) to the outrigger rotary parts before hoisting the machine.

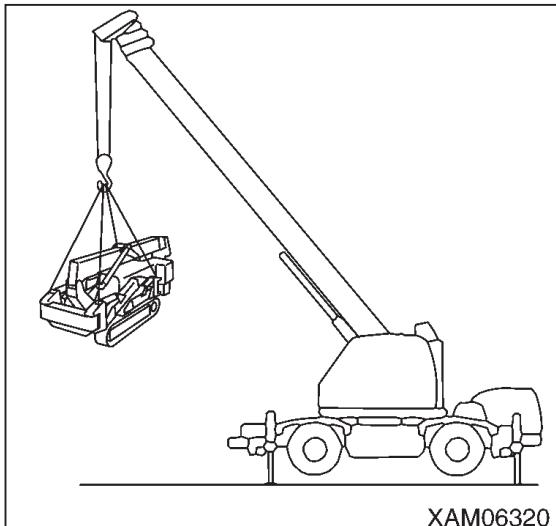
The centre of gravity position of the machine has been decided under the condition where the machine posture was “travelling posture”.

For more information, see

“5.2.5 TRAVELLING POSTURE”.



- Use the carrying instruments shown the lower figure and work safely when carrying the machine using a crane.
- ☞ Recommended hoisting equipment
 - Wire ropes (front two):
Length 2400 mm, Breaking force 9.0t or better, with single eye lock and single thimble
 - Wire ropes (rear two):
Length 2000 mm, Breaking force 9.0t or better, with single eye lock and single thimble
 - Shackle:
Breaking force 1.5t or better

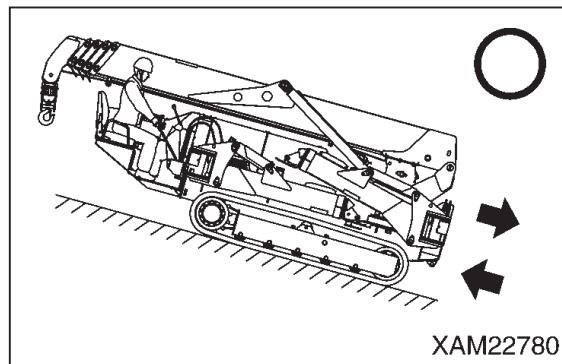


5.8.2 LOADING/UNLOADING

⚠ WARNING

- For the dimensions and mass of the machine, see "Chapter 3 SPECIFICATIONS."
- Select loading plates that satisfy the following conditions.
 - Long enough for achieving an angle of 15 degrees or less when set on the trailer
 - Wider than the crawler width
 - Thick and strong enough for sustaining the mass of the machine
- Set the loading plates parallel each other and perpendicular to the rear side of the trailer bed with an equal distance from the center of the trailer.

- Set the machine to the travelling posture when you load/unload the machine. For the travelling posture, see "5.2.5 TRAVELLING POSTURE."

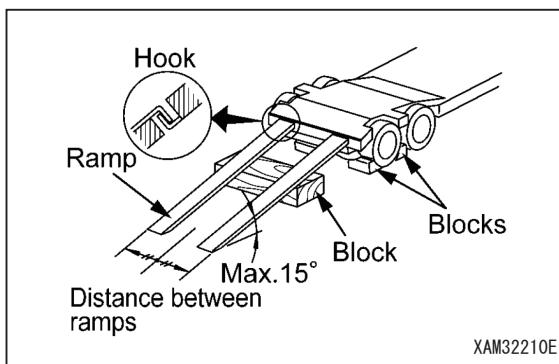


- Be sure to drive the machine forward when you load the machine. Backward driving has the risk of tipping-over.
- Be sure to drive the machine backward when you unload the machine. Forward driving has the risk of tipping-over.
- Select a place of level and firm ground when you load/unload the machine. Select a place that is reasonably distant from the road shoulder.
- When you unload the machine to an embankment or platform, make sure that it has an adequate width, strength, and gradient.
- Remove mud from crawlers so that the machine does not skid on the loading plates. Wipe grease, oil, snow, ice, and other adhering matters off the loading plates.
- On the loading plates, never make operations other than forward/backward travelling and never change the travelling direction. When you want to change the travelling direction, drive the machine to get off the loading plate, and then change the travelling direction.
- When the machine moves through the end of the loading plates on to the trailer bed, the machine loses balance and becomes dangerous with a sudden movement of its gravity center. Drive the machine very slowly.

- When you change the orientation of the machine on the trailer bed, do it slowly because the trailer bed is not stable.
- After loading the machine, secure the machine firmly using wood blocks and wire ropes.

Always put the machine in the “travelling posture” when loading/unloading the machine. Always use ramp boards or forwarding blocks when loading/unloading the machine and use the following procedure.

1. Brake the trailer securely. Place wheel blocks to the wheels of the trailer to secure the trailer.
2. Secure the ramp boards in a way that the centre of the trailer and the machine agree.
 - ☞ Verify that the two lamp boards are at the same height.



3. Operate the acceleration pedal and keep the engine at low speed.
4. TRAVEL slowly toward the ramp boards, and load/unload the machine in a way that the boom does not hit the trailer. Move backward to load the machine, and forward to unload the machine.
5. Do not operate any other lever than travelling levers on the ramp boards.
6. Load the machine properly to the desired position on the trailer.

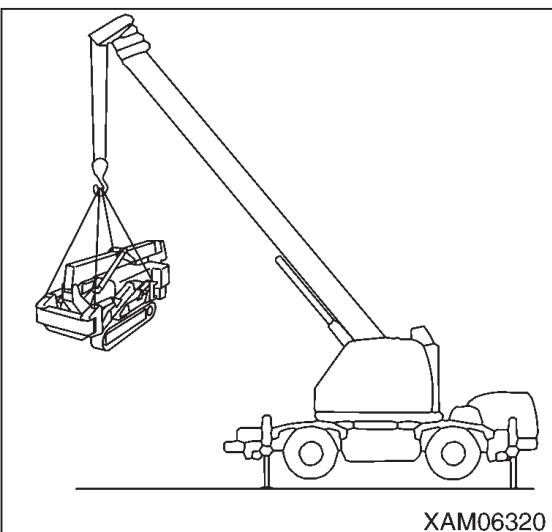
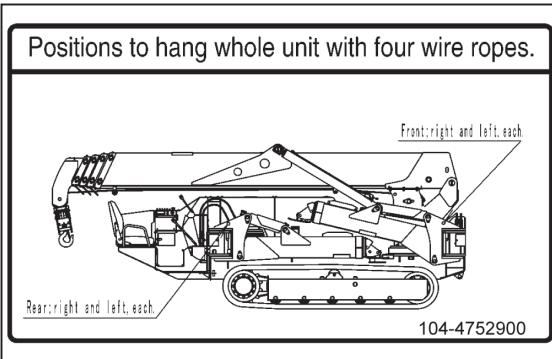
5.8.3 HOISTING MACHINE

⚠ WARNING

- When you hoist the machine body, make sure that the outriggers are stowed, and hoist the machine by “four-wire-lifting” at the four lifting brackets on the outrigger top boxes. If you hoist the machine by some other way or by using lifting brackets but not by four-wire-lifting, the machine may break and drop, resulting in a serious injury.
- The hoisting attachments such as wire rope and shackle used in hoisting shall be sufficiently strong for the weight of this machine.
- When hoisting the machine, always put the machine in the “travelling posture” and securely insert the four position pins into the rotary of the outriggers.

As for the centre of gravity of the

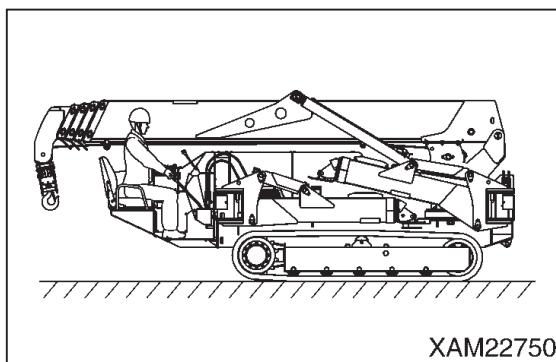
machine, the machine posture is determined to be “travelling posture.” For more information on travelling posture, see “5.2.5 TRAVELLING POSTURE.”



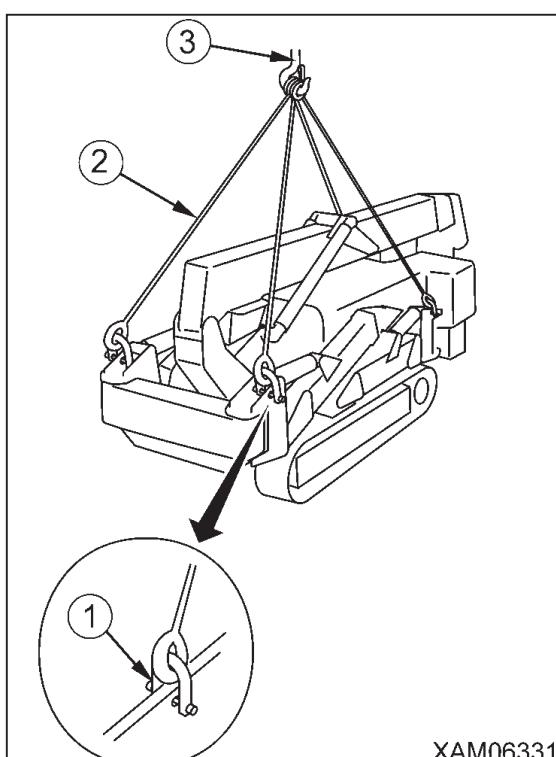
- The dimensions are for standard specifications. The hoisting method varies depending on the attachments and options mounted. In that case, contact us or our sales service agency.

Hoist the machine on the solid and flat ground using the following procedure.

1. See “5.2.5 TRAVELLING POSTURE” and put the machine in the “travelling posture.”



2. Verify that the position pins (four) are securely inserted in the rotary joint of the outrigger.
3. Install a shackle (1) to the holes (4 locations) on the outrigger rotaries and hang the hoisting attachments (2) over the hook (3).



⚠ CAUTION

- When the local laws and regulations are applicable, the person who uses the crane to perform hoisting operation must be qualified to do it. If not, the operator must be well trained and skilled.
- See the Dimension or the nameplate attached to the machine for the weight of the machine.

MC405C
MACHINE WEIGHT

Component	Weight
Main Unit	5 640 kg
Electric Unit	+ 150 kg
850 kg Searcher Hook	+ 30 kg
Fly-Jib	+ 150 kg

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4. As soon as the machine leaves the ground, stop and wait until the machine is stabilised. Then slowly hoist the machine.
5. Check the changes in the posture due to the leakage from the hydraulic circuit on the head side of the derrick cylinder (4) when the machine is hoisted.

☞ Recommended hoisting attachments

- Wire ropes (two in front):
breaking force of 9.0 t or more
- Wire ropes (two in back):
breaking force of 9.0 t or more
- Shackle:
Load used 1.5 t or more

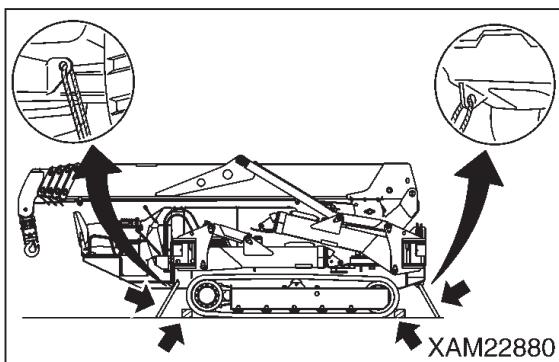
5.8.4 CAUTIONS ON LOADING MACHINE

⚠ WARNING

Select flat and solid ground for loading/unloading the machine. Keep sufficient distance from the shoulders.

Load the machine to the specified position on the trailer and secure the machine with the following procedure.

1. Stop the engine and remove the key of the starter switch.
2. Provide a square timber in front and back of the rubber tracks to prevent the machine from moving during transportation. Secure the machine with chain or wire rope. Secure it surely, especially not to let it slip to the side.



5.8.5 CAUTIONS DURING TRANSPORTATION

⚠ WARNING

Take road width, height, and weight into consideration in determining the transportation route.

If there are applicable local laws and regulations, observe these laws and regulations for safe transportation.

If not, contact us or our sales service agency.

Chapter 6

INSPECTION AND

MAINTENANCE

6.1 MAINTENANCE PRECAUTIONS

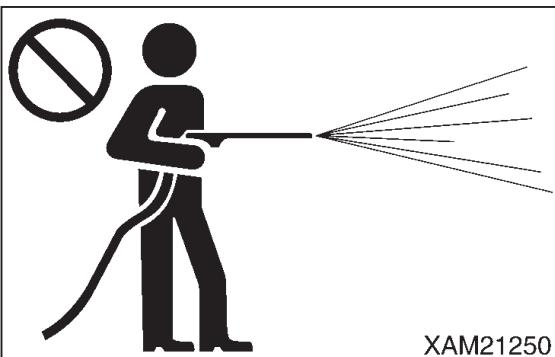
6.1.1 PRECAUTIONS BEFORE MAINTENANCE

FAILURE REPORT

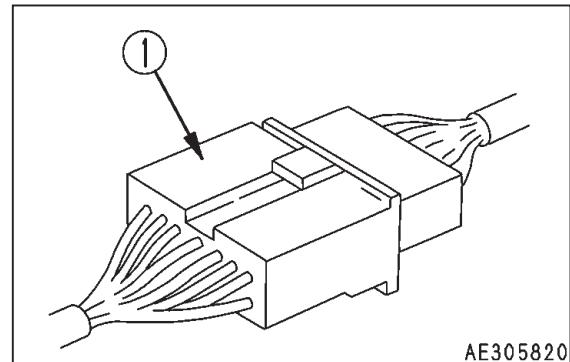
Execution of a maintenance not described in our manual may cause unexpected failures. Ask us or our sales service agency for repair.

CLEAN BEFORE INSPECTION OR MAINTENANCE

- Before starting an inspection or maintenance, clean the Machine and prevent rubbish from entering the Machine and make sure the safety will be ensured during maintenance.
- Attempt to inspect or maintain the Machine still dirty not only lessens chance of locating faulty part, but may cause rubbish or mud entering your eye, or slipping and tripping that result in injury.
- Always observe the following when washing the vehicle.
 - Use anti-slip shoes to prevent slips and trips caused by wet foothold.
 - Put on protective equipment when using a high pressure steam car washer. Avoid an accident from high pressure water which causes skin laceration or mud or other substance to fly to eyes.



Do not directly spray water onto the electrical system (sensors and connectors (1)). Water entering the electrical system is dangerous and will cause faulty or improper operations.



TIDY UP WORKPLACE

Always tidy away tools, hammers and other things that obstruct the working area; grease and oil should be wiped off immediately after use to assure safe operations.

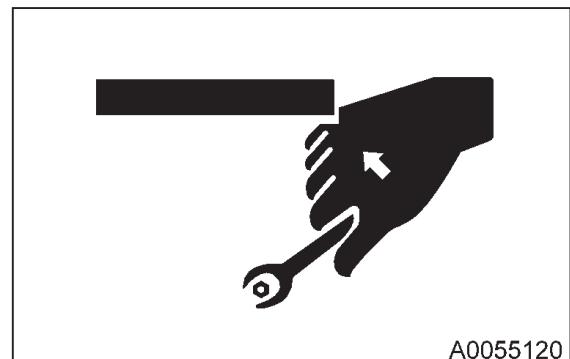
An untidy workplace may cause safety hazards and result in injuries to personnel.

FOLLOW SUPERVISOR'S INSTRUCTION DURING TEAMWORK

Appoint a person who supervises the work and follow his/her instructions in case of Machine repair or installing/uninstalling a work device. Unexpected accidents due to misunderstood communication between workers may occur during teamwork.

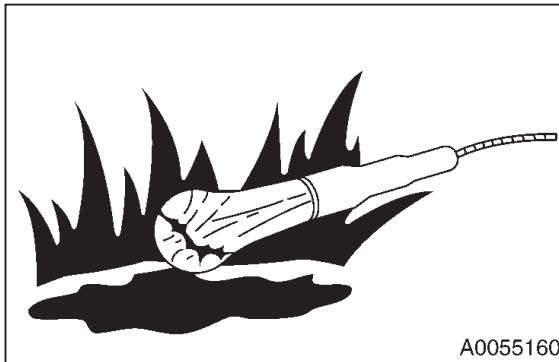
USE APPROPRIATE TOOLS

Use proper tools and handle them in correct manners. Using a damaged or deformed tool and using it for any purpose other than its intended application may give rise to a serious bodily accident.



HANDLING ILLUMINATION DEVICES

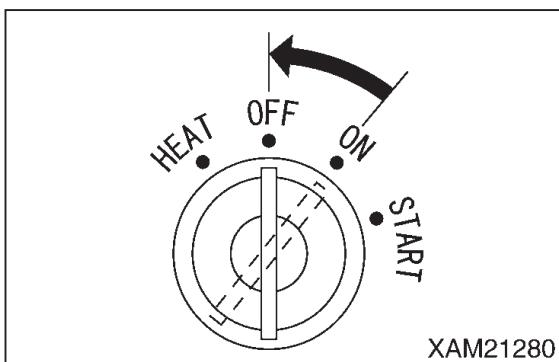
- Use explosion proof illumination device when inspecting with fuel, oil, or similar substance. Failure to use explosion proof illumination device may cause leap fire and explosion.
- Attempt to work without using illumination device in a dark place may cause injury or other issue. Always use illumination device. Do not use a lighter or other burning object even if dark. Such use may cause fire, and furthermore the battery gas may catch fire and explode.



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KEEP ENGINE STANDING STILL DURING INSPECTION AND MAINTENANCE

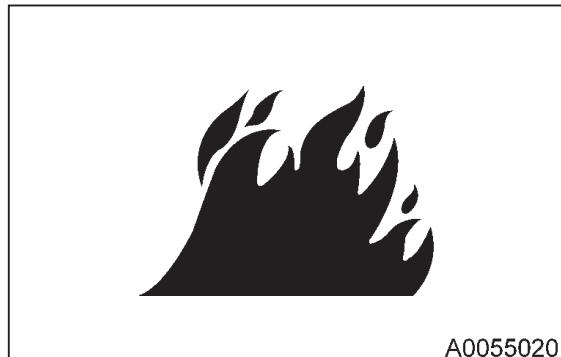
- Before inspection or maintenance, always park the machine at a location where the ground is level, rock-falls and landslides do not occur, is a lowland and flood does not occur, and fully retract and lower the boom, and stop the engine.
- Operate each of the crane operation levers forward backward several times to relief the pressure remaining in the hydraulic circuits.
- Apply pawls to so that the prevent rubber tracks do not move.
- Persons in charge of the maintenance should pay attention to prevent physical body and clothes from contacting the moving parts.



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FIRE RISK PREVENTION

Always observe the followings during maintenance where the fuel, oil, battery or other substance that may catch fire is handled.



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- Keep the fuel, oil and any other easily combustible oil and fats away from fire during storage.
- Do not leave the site when replenishing the fuel or oil.
- Use incombustible cleaning oil for the objects such as the components, and do not use light petroleum, gasoline or anything else that may catch fire.
- Do not smoke when inspecting or maintaining. Smoke at a location designated to do so.



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- When inspecting fuel, oil, or similar, use explosion proof illumination devices but do not use fires such as a lighter or a match for illumination.
- Loosened and damaged electrical connections may cause short circuit that may result in a fire. Inspect accordingly during the inspections before starting work.
- Make sure a fire extinguisher is place near the inspection / maintenance site.

6.1.2 PRECAUTIONS DURING MAINTENANCE

COMMUNICATIONS HAZARD

- Follow the policies and instructions established by your employer and authorities having jurisdiction. The policies have been developed to protect you and your co-workers from needless personal injury.
- Post signs to alert people that are not authorised to be in the shop that they must stay out of the work area.

WORK WHEN AN ABNORMALITY IS FOUND DURING INSPECTION

- If you find any abnormalities during the inspection, be sure to repair them. If you use it without repairing the abnormalities, it may cause personal injury.
- Ask us or our sales service agency for repair depending on the details of the failure.

DO NOT DROP TOOL OR PART INSIDE MACHINE

- Do not drop any bolt, nut or tool inside the machine when inspecting while opening the inspection port or tank replenishment port. Dropped object may damage the machine or cause the machine to operate improperly and thus may cause accidents. If dropped, always retrieve.
- Do not keep anything unnecessary for the inspection in your pocket.

BEWARE OF NOISE

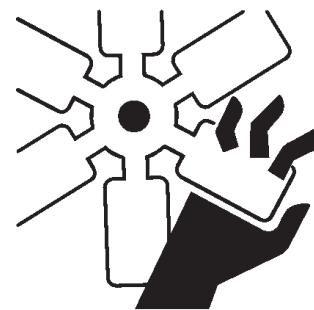
Use ear protection or ear plugs during long-term noise exposure, such as engine maintenance servicing. Large noise in the surroundings may cause hearing difficulty or deafness.

WORK BY AT LEAST TWO PERSONS DURING MAINTENANCE WITH ENGINE RUNNING

To prevent accidents, do not attempt maintenance when the engine is running.

Always observe the following in case of maintaining with the engine running for unavoidable reason.

- One person should occupy the operating seat to be ready for stopping at any time, and keep communications each other.
- When working near such rotating parts as fan, belt, and winch drum, keep the operator's body and any object that can be readily caught away from these parts.
- Do not touch operation levers and pedals. If it is unavoidable to use the operation levers and pedals, always give a sign to the other person and let him/her evacuate to a safe place.
- Do not contact with the alternator belt or other part that severs upon contact with human body or tool.



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WORKING UNDER MACHINE HAZARD

- Park the machine on a flat, firm and level surface.
- Fully retract and lower the boom.
- Extend all outriggers to the maximum position so the tracks clear the ground.
- Place jack stands of sufficient strength in strategic locations under the machine to help support it during maintenance.



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WORKING ABOVE MACHINE HAZARD

- Tidy the footing to avoid falling and always observe the following precautions during maintenance on the Machine.
- Do not spill oil or grease.
- Always tidy away tools.
- Beware of the footing when walking.
- Remove dirt, oil and grease from the sole of shoes.
- Always maintain three-point contact as you climb on or off an elevated work surface.
- Never jump off the machine. Use a platform , and secure your body in three locations (both feet and one hand, or both hands and one foot) when climbing up or down the machine.
- To prevent oneself from the risk of bodily accidents caused by falling or stumbling due to slipping, never step on a hood or cover.
- Do not climb on the boom, outrigger or other machine surface.



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CAUTIONS WHEN REPLENISHING FUEL OR OIL

The fuel, oils and similar substance may catch fire if a fire comes near.

Light petroleum is used as the fuel and thus requires extra effort to observe the followings.



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- Keep the engine stopped when supplying.

- Do not smoke when supplying.



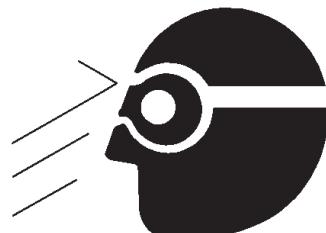
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- Immediately wipe away dripped fuel or oil.
- Securely tighten the fuel and oil caps.
- Supply fuel/oil at a location with good ventilation.
- Do not leave the site when replenishing the fuel or oil.

BEWARE OF CHIPS WHEN WORKING WITH HAMMER

During the hammering works, keep protective equipment such as protective glasses and a helmet on, and insert a copper bar or similar object between the hammer and the target when hitting.

Giving impact to a hard metal part such as a pin or a bearing may cause the broken chip to enter eye and inflict injury.



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CAUTIONS DURING WELDING REPAIR

Weld in a location with good facility, and, only authorised personnel are permitted to weld. Unauthorised personnel are strictly prohibited since risks such as gas generation, fire and electrical shock are present when welding.

The personnel authorised to weld are requested to always observe the followings.

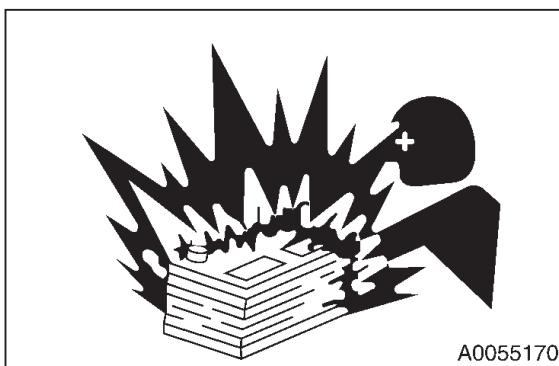
- Disconnect the battery terminals to prevent battery explosions.

- Peel off the paint from the welding section to prevent gas generation.
- Attempt to heat up a hydraulic machinery, piping or a section near such part may cause combustible vapour or mist to be generated and catch fire. Avoid heating such section.
- Directly heating a pressurised piping or rubber hose may cause a sudden snap. Apply a fire protection cover.
- Disconnect the wiring connectors of the radio control and remote control system, moment limiter display and converter.
- Put on protective equipment.
- Keep the ventilation well.
- Put away the combustibles and prepare a fire extinguisher.
- Do not ground to a location near electrical part. Such may cause the electrical part to malfunction.

DISCONNECT BATTERY TERMINAL

Disconnect (-) terminal of the battery and stop the electrical flow before repairing the electrical system or starting an electrical weld.

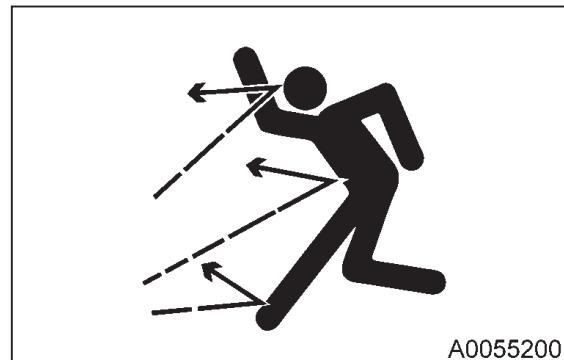
For details, see "6.21.1 BATTERIES".



CAUTIONS WHEN ADJUSTING RUBBER TRACK TENSION

- Grease is sealed inside the rubber track tension adjuster. The grease is at a high pressure because of the tension of the rubber track. Attempt to release the grease without observing the following precautions may cause the grease valve to pop out and result in serious accident.
- Do not loosen the tension adjustment grease valve one full turn or above. Doing so may cause the grease valve to pop out.

- To avoid the risk during tension adjustment, do not place your body in front of the grease valve.
- For more information, see "6.12.1.3"[1] CHECK / ADJUST RUBBER TRACK TENSION."



HANDLING HIGH PRESSURE HOSE AND PIPING

If fuel leaks from a hose or piping, there occurs a risk of fire and malfunction leading to a serious bodily accident.

When leakage of oil or fuel is detected at a loosened joint or mounted spot of hoses or piping, immediately stop the work and re-tighten them with a specified tightening torque. Also, when recognizing a damage or deformation of hoses and piping, consult with us or our sales service agency.

If any of the following conditions is found, replace the faulty parts:

- Damage of a hose or deformation of sleeve
- Scratch or truncation of the covering layer, or exposure of wire reinforcement layer
- Covering layer is partially swollen
- Indication of twist or collapse on a movable part of hose
- Foreign object buried in coating

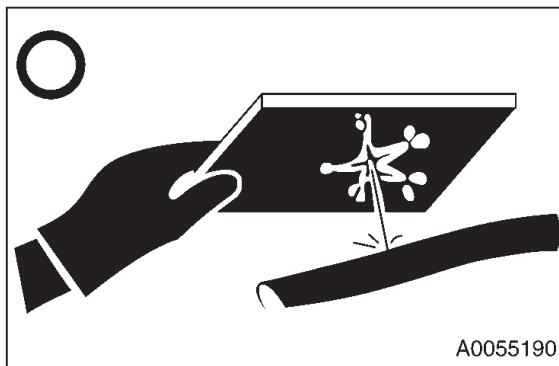
BEWARE OF OIL UNDER HIGH INTERNAL PRESSURE

The hydraulic system is constantly subjected to an internal pressure. Thus, when checking or replacing the piping and hoses, failure to ensuring that the internal pressure of the circuit has been relieved gives rise to a serious bodily accident.

Strictly observe the following.

- Never replace piping or hoses while the hydraulic circuit is subjected to an internal pressure. Be sure to relieve the pressure of the hydraulic circuit.
- If an oil leakage is taking place, the piping, hoses and their periphery are wet. Check to ensure that the piping is free from fissures and the hoses have no cracking or swelling. Be sure to wear protective equipment such as goggles and gloves during the inspection work.

- High pressure oil leaking through a small hole may puncture the skin or destroy eyesight upon direct contact. If this happens, wash away with flowing clean water and see the doctor as soon as possible.



CAUTIONS WHEN TEMPERATURE IS HIGH

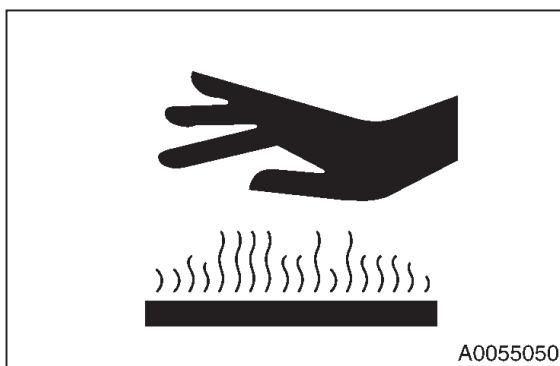
Parts such as the engine, all oils, exhaust system manifold and muffler are at high temperature during short time after stopping the engine.

Attempt to remove the cap or execute a maintenance such as oil draining, water draining or filter replacement may result in suffering burns.

Wait until the temperature lowers, then execute the inspection/maintenance following the procedure written in this manual.

- "6.12.1.2 PRE-START INSPECTION - BEFORE STARTING ENGINE" :Checking coolant level, checking oil level in engine oil pan, checking oil level in hydraulic oil tank
- "6.18.7 MAINTENANCE EVERY 250 HOURS" :Replacement engine oil and oil filter, replacement hydraulic oil return filter, replacement hydraulic oil suction filter

- “6.18.9 MAINTENANCE EVERY 1000 HOURS” :Replacement oil inside hydraulic oil tank



CHECKS AFTER INSPECTION/ MAINTENANCE

Failure to execute an inspection/maintenance item or failure to check the function and operation of the maintained part may cause an unexpected fault which may result in bodily accidents.

Always observe the followings.

- Checks with engine stopped
 - Check for unexecuted inspection/maintenance.
 - Check that inspection/maintenance was done without errors.
 - Check for any dropped tool or part. Ones caught by the interior or lever related link mechanism poses extra danger.
 - Check for any fuel leak, water leak, oil leak, bolt loose and similar issues.

- Check with engine running

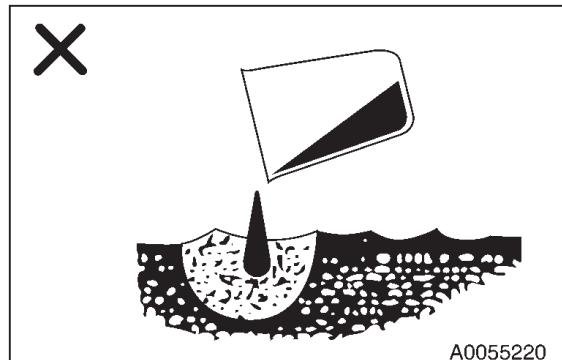
Be fully careful with safety when checking with the engine running while referring to “ WORK BY AT LEAST TWO PERSONS DURING MAINTENANCE WITH ENGINE RUNNING.”

 - Check that the inspected/maintained part operates normally.
 - Check that issues such as an oil leak do not occur when load is applied to the oil pressure by increasing the engine rotation.

CAUTIONS WHEN TREATING WASTE

In respect of the environment protection, pay sufficient attention to the treatment of waste matters.

- Be sure to use drums and tanks to hold the discharged waste liquid. Never allow waste liquid to flow on the ground, into river, drainage, sea or lake.
- Observe the applicable legal regulations and rules when disposing of this Machine as well as harmful substances such as oil, fuel, solvent, filter or battery.



6.2 GENERAL MAINTENANCE INFORMATION AND PRECAUTIONS

Thorough understanding of the inspection and maintenance items is required to perform efficient inspection and maintenance that contributes to safe use of this machine.

⚠ WARNING

- Do not perform any inspection or maintenance that is not described in this manual.
Potential serious accident or machine failure may occur if it is performed at the discretion of the individual.
In the event that a judgment on the severity of a failure or malfunction is unable to be made, contact us or our sales service agency.
- In the event that a failure or malfunction is encountered in machine operation or found in inspection, report it to your employer or supervisor immediately.
Contact us or our sales service agency.
- Inspection and maintenance should be performed with the machine placed on a level and strong footing.

[1] CHECK THE SERVICE METERS

Read the service meters daily to check for any maintenance item that reached the obligatory maintenance period.

[2] USE GENUINE PARTS FOR REPLACEMENT

Always use Maeda genuine parts as specified in the parts catalogue for part replacement.

[3] USE PURE GREASE

Always use Maeda pure grease. The viscosity of grease must conform to specifications according to ambient temperature.

[4] USE CLEAN OIL AND GREASE

Always use clean oil, grease, and container to keep impurities out of them.

[5] KEEP THE MACHINE CLEAN

Keep the machine clean to facilitate the detection of a malfunction. Especially keep the grease nipple, breather, and oil level gauge (oil access door) clean to prevent impurities from finding their way into the machine.

[6] HANDLE WATER AND OIL AT ADEQUATE TEMPERATURE

Drainage, drain oil, and exhaust filter will be at elevated temperatures immediately after the machine comes to a stop. Replace drainage, drain oil, and filter only after they drop in temperature for safety.
If the oil is cold, raise the temperature of the oil to approx. 20 to 40°C.

[7] CHECK DRAIN OIL AND OIL FILTER

For replacement of oil and filter, check the drain oil and exhaust filter to make sure no a considerable amount of metal powder or foreign objects is present.

[8] CAUTIONS FOR LUBRICATION

Do not remove the strainer to lubricate if it is attached to the lubrication opening.

[9] PROTECT OIL FROM IMPURITIES

Avoid dust when inspecting and replacing the oil to keep impurities out of the oil.

[10] ATTACH A WARNING TAG

When draining coolant and oil, always attach a warning tag to the travel control for the prevention of accidental engine starting.

[11] FOLLOW SAFETY PRECAUTIONS

Safety precautions provided on the machine should always be followed when using the machine.

[12] CAUTIONS FOR WELD REPAIR

- Power off the machine. (Turn OFF the start switch)
- Do not continuously apply 200V or greater.
- Ground the machine within 1 metre from the welding point.
- Be sure to disconnect the connectors of the radio or remote control system, moment limiting indicator, and controller.
- Remove the negative terminal (-) of the battery.
- Make sure no sealing or bearing is present between the welding point and the grounding point.
Potential damage to sealing may occur due to sparks if disregarded.
- Do not ground around the boom pin or the hydraulic cylinder.
Potential damage to a plated section may occur due to sparks if disregarded.

[13] KEEP FROM FLAME

Always clean the parts with noncombustible cleaning agent or diesel oil.
Keep the machine from flame when using diesel oil.

[14] KEEP THE ATTACHMENT SURFACE CLEAN

Be sure to clean the attachment surface after removing a part to which the O-ring and gasket sealing are attached.
Replace the part with a new one with the O-ring and gasket reattached.

[15] EMPTY YOUR POCKETS

Always empty your pockets before performing inspection and maintenance of the machine in a downward direction with the cover opened.

[16] ASSURE SAFE RUBBER TRACK

When performing crane operation in a rocky location, make sure of no damage to the rubber track and no looseness, cracks, abrasion of bolts and nuts. Loosen the tension of the crawler tread more than usual.

[17] CAUTIONS FOR MACHINE WASH

- Do not direct a jet of steam to the electrical parts and connector.
- Keep the operation panel dry.
- Wash the machine with clean cloth, rinsing off dirt and dust.

[18] PRE- AND POST-WORK INSPECTION

Before performing crane operation in the muddy water, rain, snow and on the seashore, always check plugs and valves for looseness. Post-work inspection requires check all the units for cracks and damages and check bolts and nuts for looseness and coming off, with the machine washed.
Carry out early greasing. Grease the operating pin that enters the muddy water on a daily basis.

[19] CAUTIONS FOR WORKING IN A DUSTY SITE

The following precautions should be observed when working in a dusty site.

- Occasionally check the air cleaner for clogging.
- Clean and replace the fuel filter in a timely manner.
- Be sure to clean the electrical parts, especially the starter and alternator, to protect them from dust.

[20] DO NOT MIX OIL

Never use together with different types of oil under any circumstance.
Replace the oil entirely when replenishing a different type of oil.
Always use Maeda genuine parts for part replacement.

6.3 BASIC MAINTENANCE

[1] OIL HANDLING

- Oil is used under extremely harsh conditions (high temperature, high pressure) in the engine and working device, which causes the oil to undergo deterioration with operating time.

Always use oil that meets requirements such as grade and operating temperature defined in the operation manual. Be sure to perform periodic replacement of oil irrespective of contamination in the oil.

- Oil is equivalent to human blood. Exercise due caution to handle oil, keeping impurities (such as water, metal powder or dust) out of oil. Most of mechanical failures are attributed to intrusion of impurities.

Extra caution is required to prevent impurities from finding their way during machine storage and lubrication.

- Do not mix oil with other oil of different grade or brand.

- Oil lubrication must conform to the designated quantity of oil.

Failure to lubricate at adequate quantity can lead to a machine failure.

- In the event that oil used in the working device turns cloudy, potential intrusion of moisture or air into the oil may be considered. Contact us or our sales service agency.

- When replacing oil, always replace the relevant filter as well.

- “ISO VG32” is adopted for a hydraulic oil system as factory default.

Do not use any other hydraulic oil that is not recommended by us. Failure to follow the instruction may cause the filters to get clogged. A minute amount of oil remaining in piping and cylinders does not cause problems even if mixed with other oil.

[2] FUEL HANDLING

- The fuel pump is precision equipment that becomes inoperative if fuel containing moisture or impurities is used.
- Extra caution is required to prevent impurities from finding their way during machine storage and lubrication.
- Do not remove the strainer when replenishing fuel.
- Always use fuel that meets requirements such as grade and operating temperature defined in the operation manual.
- Ensure that the fuel tank is filled up after finishing daily work to prevent condensation of the humid air inside the fuel tank that will result in intrusion of moisture.
- Drain deposits and water out of the fuel tank before starting the engine or approximately 10 minutes after fuel replenishment.
- The air should be released from the circuit when the machine runs out of fuel or fuel filter replacement is performed.
- Clean the tank and fuel system if any foreign objects enter the fuel tank.

[3] STOCKING AND STORAGE OF OIL AND FUEL

- Stock and store oil and fuel indoors to keep impurities such as moisture or dust out of them.
- When storing oil and fuel in drums for a long time, line the drums horizontally aligning the drum bungs sideways (to store them away from moisture). Be sure to cover the drums with a waterproof sheet if storing them outside.
- To prevent deterioration of oil and fuel resulted from long-term storage, employ the first-in first-out for using oil and fuel.

[4] GREASE HANDLING

- Grease is designed to prevent the joint from rattling and making noise.

- A nipple that is not described in the Periodic Maintenance chapter is used for overhauls, which requires no grease replenishment. Grease the nipple if a long-term use hinders its smoothness.
- Wipe off old grease squeezed out after greasing. Extra care is required to wipe a part that the adhesion of sands and dust accelerates the wearing away of the rotating part.

[5] FILTER HANDLING

- A filter is an extremely important part that keeps major equipment free from impurities in oil, fuel, and the air circuit, which prevents an associated failure. Periodic replacement of the filter is required in accordance with the Operation Manual. The replacement period should be shortened in responses to harsh operating environments or the oil used.
- Do not reuse any washed filters (cartridge type one) under any circumstances.
- After replacing an oil filter, check the used filter for any metal powder. If check finds metal powder on the used filter, contact us or our sales service agency.
- As to a replacement filter, always unpack it immediately prior to its use.
- Always use Maeda genuine filters.

[6] COOLANT HANDLING

- The river water contains a large amount of calcium and impurities. Use of the river water results in accumulation of water stain in the engine and radiator, which causes heat exchange error leading to overheat. Do not use any non-potable water.
- Always use antifreeze following precautions stated in the Operation Manual.
- Keep antifreeze from flame. Antifreeze is a flammable solution.
- The mixing proportion of antifreeze varies with outside air temperature. For more information on mixing proportions, see “6.18.9 [5] CLEAN INSIDE ENGINE COOLING SYSTEM.”

- In the event of overheating, replenish coolant with the engine cold.
- The machine low in coolant may cause overheating and corrosion attributed to aeration.

[7] ELECTRICAL PART HANDLING

- The electrical parts are susceptible to water damage and damaged coating. A current leakage is developed if the electrical parts are wetted or have damaged coating, which causes the machine to go out of order and malfunction. Exercise due caution to handle the electrical parts.
- Inspection and maintenance include the checking of belt tension, belt damage, and battery charge level.
- Never remove and disassemble equipment (electrical parts) from the machine.
- Only optional electrical parts that accompany the machine can be installed.
- Keep the electrical parts away from water when the machine is washed and used in the rain.
- When using the machine at the seashore, keep the electrical parts free of water and impurities to prevent corrosion.

[8] HYDRAULIC EQUIPMENT HANDLING

- Hydraulic equipment will be at elevated temperatures during and immediately after operation. Hydraulic equipment operates under high pressure. The following precautions should be observed when performing inspection and maintenance of hydraulic equipment.
- Place the machine in travel position on a level surface to inhibit the application of pressure to the cylinder circuit.
- Be sure to stop the engine.
- Hydraulic oil and lubricating oil will be at elevated temperatures and high pressure immediately after equipment comes to a stop. Perform inspection and maintenance only after the oil drop in temperature for

safety. An internal pressure may be exerted despite temperature drop. When removing the plugs, screws and hose joints, stand aside and provide gradual loosening to decompress.

- Be sure to remove the pressure releasing air from the hydraulic oil tank before performing inspection and maintenance of the hydraulic circuit.
- Inspection and maintenance include hydraulic oil level check and replacement of the filters and hydraulic oil.
- Check the O-ring for scratches when removing the high-pressure hose. If check finds scratches, replace the O-ring.
- Air bleed of the hydraulic circuit is required after the following tasks are performed: replacement and cleaning of the hydraulic oil filter element and strainer, repair and replacement of hydraulic equipment, and hydraulic piping replacement.

6.4 LEGAL INSPECTION

If periodic inspection for machine safety assurance is stipulated by laws and regulations of your country, perform inspection complying with the inspection items listed below.

1. Make sure no abnormal event is present in the safety devices.
2. Check the hoisting accessories including a hook block for any abnormalities.
3. Check the winch wire rope end and wire clip for breakage.
4. Replace the wire rope promptly if it is damaged.
5. Check the hydraulic hose for oil leaks and friction flaws on the surface. Replace the hose if a surface flaw is detected.
6. Check the structural part including a boom for cracks and deformations.
7. Check the mounting bolts and joints for looseness and falling off.
8. Check if the booms perform proper operation and stop in extending, retracting, raising, lowering, and slewing.

If check finds a malfunction, contact us or our sales service agency.

6.5 CONSUMABLES

6.5.1 MACHINE CONSUMABLES

- Consumables such as a filter element and wire rope are to be replaced upon periodic maintenance or prior to the wear limit. Proper replacement of consumables delivers increased economy in machine use.
- Always use Maeda genuine parts for part replacement.
- See the parts catalogue for part numbers when ordering parts.

LIST OF CONSUMABLES

Item	Replacement cycle
Engine oil filter	Every 500 hrs (initial 50 hrs)
Fuel filter	Every 500 hrs
Hydraulic oil return filter	Every 500 hrs (initial 50 hrs)
Hydraulic oil suction filter	Every 500 hrs (initial 50 hrs)
Air cleaner filter	Every 500 hrs
Cylinder gasket	*3 yrs
Boom slide plate	Every 3 yrs
Winch wire rope	*Every 3 yrs
Boom extending wire rope	*Every 3 yrs
Boom retracting wire rope	*Every 3 yrs
Slew ring mounting bolt	Every 7 yrs or Every 7000 hrs

- The cycles marked with an “*” in Replacement cycle include a halt period. Contact us or our sales service agency for part replacement.

6.5.2 850kg SEARCHER HOOK CONSUMABLES

Parts for mounting searcher hook are consumable items. Replace them at periodic inspection or before they reach abrasion limits. Replace consumable items regularly, which will produce economical use of this machine. Always replace with a Maeda genuine item. Check parts catalogue for correct part number for parts request.

LIST OF CONSUMABLES

Item	Replacement cycle
Searcher hook fix bolt M12x35L strength 10.9 (4pcs)	Every 6 months or when damage, crack, or squash is found
Searcher hook fix bolt M12x30L strength 10.9 (4pcs)	
Searcher hook fix bolt M8x16L strength 10.9 (1pcs)	
Searcher hook fix nut M12x1grade (8pcs)	
Searcher hook fix washer M12x3.2t (high tension) (8pcs)	

Items include a halt period. Contact us or our sales service agency for part replacement information.

6.5.3 1.5t SEARCHER HOOK CONSUMABLES

Parts for mounting searcher hook are consumable items. Replace them at periodic inspection or before they reach abrasion limits. Replace consumable items regularly, which will produce economical use of this machine. Always replace with a Maeda genuine item. Check parts catalog for correct part number for parts request.

LIST OF CONSUMABLES

Item	Replacement cycle
Searcher hook fix bolt M12x35L strength 10.9 (4pcs)	Every 6 months or when damage, crack, or squash is found
Searcher hook fix bolt M12x30L strength 10.9 (4pcs)	
Searcher hook fix bolt M8x16L strength 10.9 (1pcs)	
Searcher hook fix nut M12x1grade (8pcs)	
Searcher hook fix washer M12x3.2t (high tension) (8pcs)	

Items include a halt period. Contact Maeda or a Maeda sales service agency for part replacement information.

6.6 LUBRICATING OIL

6.6.1 USE OF FUEL AND LUBRICATING OIL ACCORDING TO TEMPERATURES

Use of lubricating oil should vary with changes in temperature

Lubricating place	Type of oil	Use by temperature										Specified capacity (liter)	Volume to replace (liter)										
		-22	-4	14	32	50	68	86	104	122°F	-30	-20	-10	0	10	20	30	40	50°C				
Engine oil pan	Engine oil									SAE 30WCD										6.7	6.2		
						SAE10WCD																	
						SAE 10W-30CD																	
						SAE 15W-40CD																	
Hydraulic oil tank	Hydraulic oil					ISO VG32														75	55		
						ISO VG46																	
Swing reducer	Gear oil					ISO VG320														0.8	0.8		
Winch reducer						ISO VG150														0.5	0.5		
Travel motor reducer						SAE30CD														1.0	1.0		
Fuel tank	Diesel fuel					ULSD														60	—		
Cooling system	Water	Nonfreezing fluid addition																		4.5	—		

- A specified oil quantity is defined as a total quantity of oil including that for unit piping, and a replacement oil quantity is defined as a quantity of oil to be replaced at inspection and maintenance.
- Always use SAE10W-CD, SAE10W-30CD, or SAE10W-40CD to start the engine with temperature at 0°C or below despite rise in diurnal temperature to approx. 10°C.
- Be sure to use our recommended abrasion-resistant hydraulic oil for the hydraulic oil system; ISO VG46 and VG32.
“Nippon Oil Super Highland 32” is adopted for a hydraulic oil system as factory default.
- For adjustment of antifreeze concentrations in coolant with temperature at -10°C or below, see “6.18.9 [5] CLEAN INSIDE ENGINE COOLING SYSTEM.”

! CAUTION

- Molybdenum disulfide filled grease is to be applied to the boom slide plate (top), both sides and bottom of the boom.
- Do not apply molybdenum disulfide filled grease to the slewing bearing.

6.7 MACHINERY COVER

⚠ WARNING

- Be sure to stop the engine and remove the starter switch key before removing the machinery cover.
- Do not remove the machinery cover immediately after the operation while the engine is still hot.

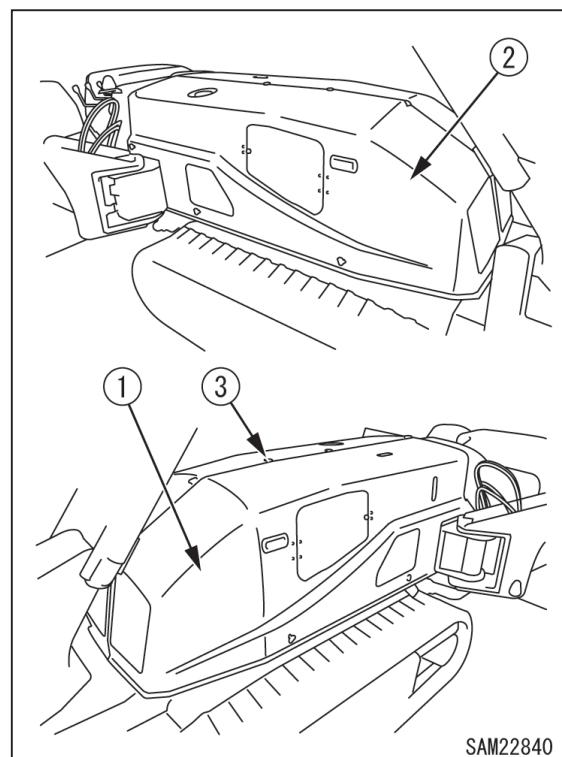
IMPORTANT

The machinery cover can be removed or reattached while the crane is stowed. Note that extending the outriggers and raising the boom slightly will provide more working space than when stowed and make the process easier.

[1] REMOVING MACHINERY COVER

Remove the machinery cover with the following procedure when performing inspection/maintenance inside the machinery cover.

1. Open all of the outriggers to an angle to allow removal of the machinery covers.
2. Remove the 11 retaining bolts (3) from the left-hand machinery cover (1) and right-hand machinery cover (2).



☞ One retaining bolt at the front, four at the top, six at the sides three each on the left and right are used to tighten with the machinery cover.

3. Pull the left-hand machinery cover (1) to the side to remove.
4. Pull the right-hand machinery cover (2) to the side to remove.

[2] INSTALLING MACHINERY COVER

When you finished inspection/maintenance in the machinery cover, install the machinery cover using the following procedure.

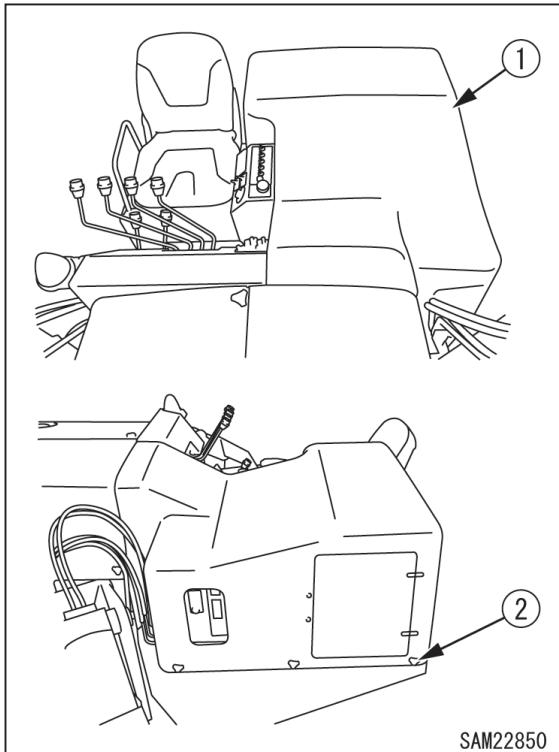
1. Reattach the right-hand machinery cover (2) in its original position.
2. Reattach the left-hand machinery cover (1) in its original position.
3. Securely tighten the 11 retaining bolts on the left-hand machinery cover (1) and right-hand machinery cover (2).
4. Rotate all outriggers back inward to stow.

6.8 REAR COVER

[1] REMOVING REAR COVER

Remove the rear cover as follows when performing inspection or maintenance inside the rear cover.

1. Remove the eight retaining bolts (2) from the rear cover (1).



2. Remove the rear cover (1).

[2] INSTALLING REAR COVER

Once inspection and maintenance inside the rear cover is complete, reattach the rear cover as follows

1. Reattach the rear cover (1) at its original position.
2. Securely tighten the eight retaining bolts (2) on the rear cover (1).

6.9 FUSES

⚠ CAUTION

Be sure to turn the starter switch to the “OFF” position when checking or replacing a fuse.

IMPORTANT

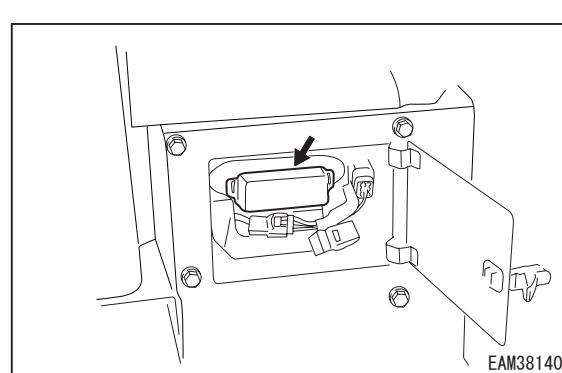
Fuses protect electrical components and wires from being burnt out.

- Fuses are blade fuses. If a fuse was corroded and shows white powder, be sure to change the fuse.
- If a fuse has melt blown, always check the cause in the circuit and repair the problem before changing the fuse.
- Always use a fuse of the same capacity when replacing one.

The fuse box is provided at the lower section of the instrument panel.

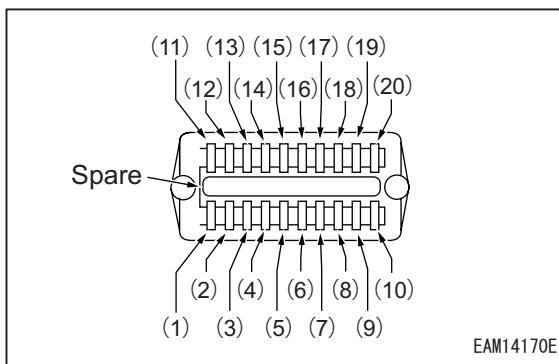
Check and replace a fuse using the procedure below.

1. Remove the buckle (2) of the cover (1) at the bottom of the instrument panel to open the cover (1).
2. Remove the cover (3) of the fuse box.



3. Remove the fuse from the fuse box and check/replace the fuse.
4. Insert a new or checked fuse to the original position in the fuse box.

[FUSE CAPACITY AND CIRCUIT NAMES]



The table below shows the fuse system and its capacity.

No.	Capacity	Circuit Name
(1)	10 A	Key switch
(2)	5 A	ECU Control
(3)	25 A	ECU Output
(4)	5A	Horn
(5)	5A	IOT(BAT)
(6)	-	-
(7)	-	-
(8)	-	-
(9)	-	-
(10)	-	-
(11)	5A	Upper power
(12)	5A	Inclination
(13)	5A	IOT(ACC)
(14)	5A	Override
(15)	-	-
(16)	10 A	Regulator
(17)	5A	T/R Start Power
(18)	5A	R/C
(19)	5A	Mode control
(20)	15 A	OR unload

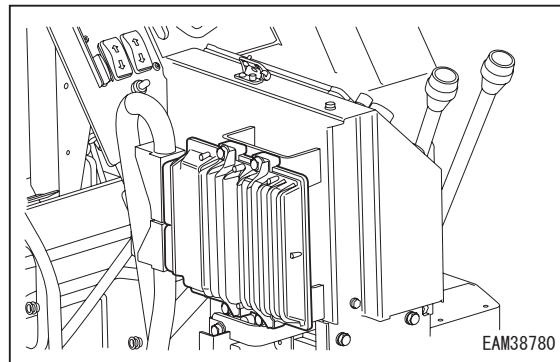
6.10 CONTROLLERS

IMPORTANT

- Do not get water, mud, etc. on the controllers. Doing so may cause malfunction.
- If a defect occurs with a controller, do not repair it yourself, but contact us or our sales service agency to request an inspection and repairs.

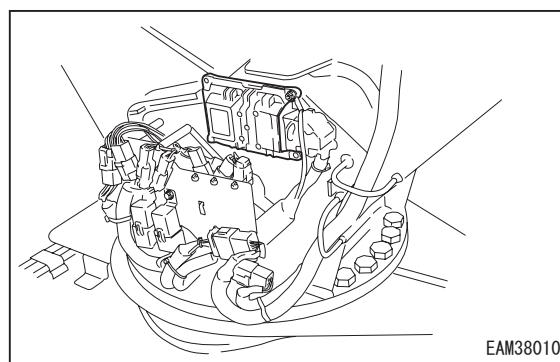
[1] MAIN CONTROLLER (TTC540)

The main controller (TTC540) is mounted under the rear cover.



[2] SUB CONTROLLER (TTC30X)

The sub controller (TTC30X) is mounted under the cover on the post.



6.11 LIST OF ITEMS FOR INSPECTION AND MAINTENANCE

6.11.1 MACHINE LIST OF ITEMS FOR INSPECTION AND MAINTENANCE

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6.11.2 850kg SEARCHER HOOK LIST OF ITEMS FOR INSPECTION AND MAINTENANCE

The following only covers the searcher hook kit. For more information on the machine body, see "6.11.1 MACHINE LIST OF ITEMS FOR INSPECTION AND MAINTENANCE" and follow its precautions.

Maintain in accordance with the laws and regulations of the relevant country and region.

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6.11.3 1.5t SEARCHER HOOK LIST OF ITEMS FOR INSPECTION AND MAINTENANCE

The following only covers the searcher hook kit. For more information on the machine body, see "6.11.1 MACHINE LIST OF ITEMS FOR INSPECTION AND MAINTENANCE" and follow its precautions.

Maintain in accordance with the laws and regulations of the relevant country and region.

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6.12 MAINTENANCE PROCEDURE

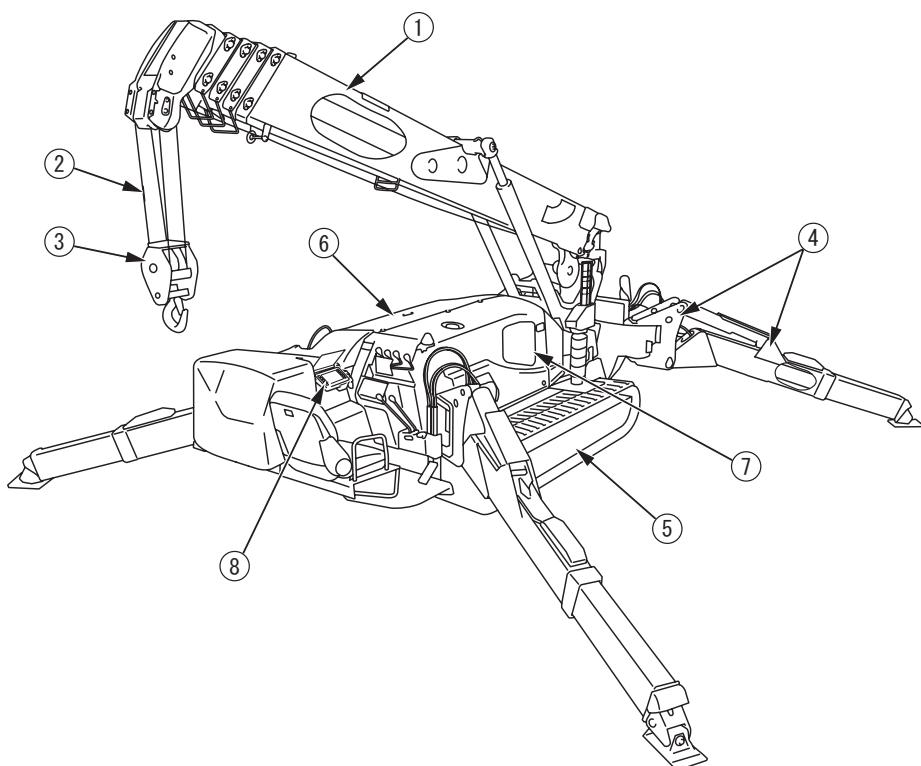
6.12.1 PRE-OPERATION INSPECTION

6.12.1.1 PRE-START VISIBLE CHECKS

⚠ WARNING

- This machine has a diesel engine.
If it smells fuel around the engine, the fuel may be leaking. Carefully check the cracks on the fuel hose or fuel hose connections.
- Buildup of combustibles and oil leakage around the hot engine section such as engine and muffler and around the battery can cause fire in the machine.
Carefully check around these areas. Should you find any abnormality, be sure to fix it or contact us or our sales service agency.

Check the items shown in this section as routine surveillance before starting the first work of every day.



EAM38600

[1] CHECK CRANE

- Look around and below the boom and post and look for any oil leak or similar. Be especially careful to check up the derrick cylinder and lower part of the winch motor near the post. If you find any abnormality, repair.
- Check each part of the post for cracks, excessive deformation, contamination and others. In addition, check bolts, nuts, pins and piping joints for any looseness, drop, damage and other matters. Be especially careful to check for looseness of decelerator mounting bolt of the post, slewing ring or slewing device. If you find any abnormality, repair.
- Check each part of the boom for cracks, excessive deformation, contamination and others. In addition, check bolts, nuts, pins and piping joints for any looseness, drop, damage and other matters. Be especially careful to check for excessive abrasion and damage of the boom support pin or derrick support pin. If you find any abnormality, repair.
- Check for excessive damage and deformity of the overwinding weight wire rope of the overwinding alarm device at the tip of the boom. If there is any abnormality, repair.
- Check for sagged electrical wire, loosened connection and trace of burns. If you find any abnormality, repair.

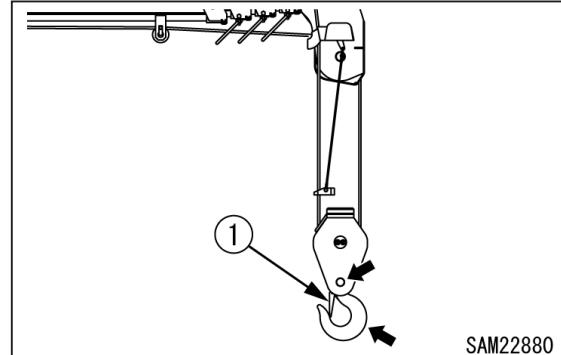
[2] CHECK WIRE ROPES

For more information on wire ropes, see "6.20 WIRE ROPE."

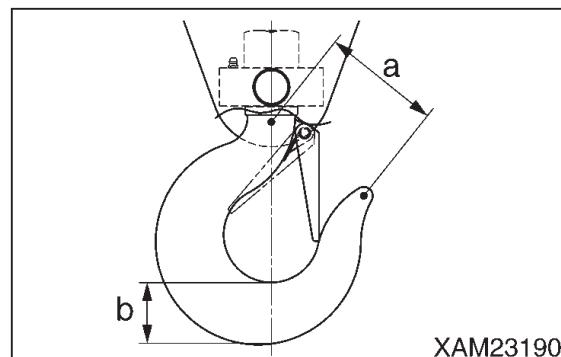
- Check the wire ropes for damage, deformation, wear, twists, kinks, corrosion, etc. If you find any abnormality, replace.
- Check the bound condition of the wire rope ends. If you find any loosened wire rope end, replace.
- Check for irregular winding of the wire ropes (wind drum). If you find any irregular winding, rewind.

[3] CHECK HOOK BLOCK

- Verify that the wire rope latch (1) functions normally. If there is any abnormality, repair.



- Rotate the hook and verify that the hook rotates smoothly and that trunnion does not emit any abnormal sound. If there is any abnormality, repair.
- Check the hook for any crack or excessive deformation. If there is any abnormality, repair.
- If dimension a between the punch marks punched on the hook became "105 mm or more" or the hook lower part dimension b became "49.5 mm or less", replace the hook.



[4] CHECK OUTRIGGERS

- Look below each of the outriggers and check for any oil leak or similar. Be especially careful to check below the outrigger cylinders. If you find any abnormality, repair.
- Check each of the rotaries, outriggers, holders and outrigger cylinders for cracks, excessive deformation, contamination and others. In addition, check bolts, nuts, pins and piping joints for any looseness, drop, damage and other matters. If you find any abnormality, repair.

- Check for sagged electrical wire, loosened connection and trace of burns. If you find any abnormality, repair.
- Pull out the position pin of each of the outriggers, rotate the relevant rotary and verify that the operation is smooth. If you find any abnormality, repair.

[5] CHECK TRACKS AND FRAME

Check each of the frames, rubber tracks, rollers, idlers and sprockets for cracks, excessive deformation, contamination and others. In addition, check bolts, nuts and pins for any looseness, drop, damage and other matters. If you find any abnormality, repair.

[6] CHECK TRAVELLING DOLLY

- Look around and below the machine and check bolts, nuts, pins and piping joints for any looseness, drop, damage and other matters. If you find any abnormality, repair.
- Look around and below the machine and look for any oil leak or similar. Be especially careful to check below the hydraulic oil tank, travel/crane operation section and each travelling motor. If you find any abnormality, repair.
- Look around and below the machine and check for breakage, excessive deformation, contamination and similar of lights such as the working status lamp. If you find any abnormality, repair.
- Look around and below the machine and check for sagged electrical wire, loosened connection and trace of burns. If you find any abnormality, repair.
- Check each of the frames, machinery covers, rear cover and other parts for cracks, excessive deformation, contamination and others. If you find any abnormality, repair.

[7] CHECK ENGINE

- Check for fuel, oil or water leaking from the engine. If you find any abnormality, repair.

- Check the hot engine sections such as the engine muffler and around the battery for the buildup and deposit of combustibles such as dead leaves, paper wastes, dust, oil, and grease. If there is any, remove them.
- Check the starter, alternator, around battery and similar parts for sagged electrical cables, piping joints, and the trace of burn. If you find any abnormality, repair.

[8] CHECK TRAVEL AND CRANE CONTROLS

- Verify that all of the operation levers, travelling levers, travelling lock lever and acceleration pedal operate smoothly. If you find any abnormality, repair.
- Check the moment limiter display and the monitor panel on the instrument panel for damages and dirtiness. If you find any abnormality, repair. If dirty, clean.
- Verify that all of the switches on the outrigger operation panel and instrument panel operate smoothly. If you find any abnormality, repair.
- Check for sagged electrical wire, loosened connection and trace of burns. If you find any abnormality, repair.

6.12.1.2 PRE-START INSPECTION - BEFORE STARTING ENGINE

Check the followings in this section without starting the engine and before starting the first work every day.

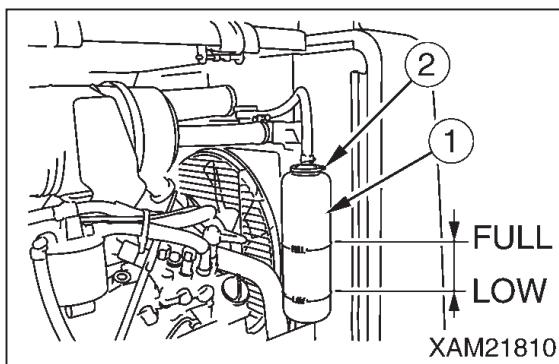
[1] CHECK / ADD ENGINE COOLANT

⚠ WARNING

Do not check or refill the coolant with the radiator cap removed. Always check and refill in the reserve tank. Heated coolant may spout, causing burns.

1. Stop the machine at levelled location.
2. Open the access hatch in the right-hand machinery cover.

- Check the coolant level in the reserve tank (1) to be between "FULL" and "LOW".

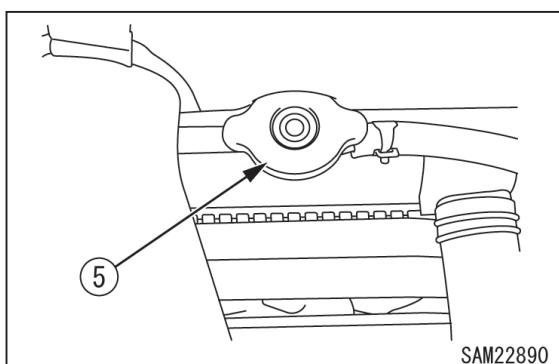


- If the coolant level is lower than the "LOW" level, use the following procedure to refill with tap water.

- Remove the cap (2) of the reserve tank (1) and fill water from the filler opening to the level "FULL".
- After refilling with coolant, securely install the cap (2) of the reserve tank (1).

- If the reserve tank was empty, follow the steps below.

- Remove the machinery cover as described in "4.2 REMOTE CONTROL SYSTEM."
- Remove the radiator cap (5) and check the coolant level in the radiator.



- If the coolant level in the radiator was low, check the radiator, radiator hose, and engine for water leakage.
- Fill water from the radiator filler opening and securely install the radiator cap (5).
- Remove the cap (2) of the reserve tank (1) and fill water from the filler opening to the level "FULL".

- After refilling with the coolant, securely install the cap (2) of the reserve tank (1).
- Reattach the machinery cover as described in "4.2 REMOTE CONTROL SYSTEM."

- Close the access hatch.

[2] CHECK / ADD ENGINE OIL

⚠ CAUTION

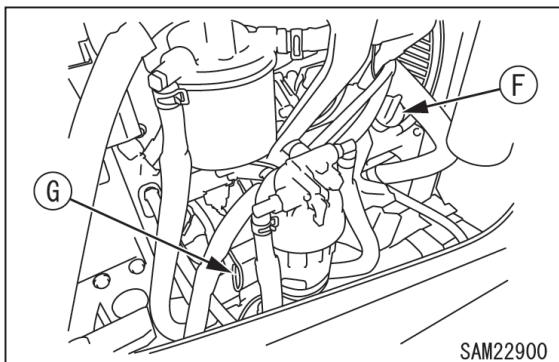
Securely install the oil level gauge and filler cap after checking the oil level and refilling with the oil. If the oil level gauge falls during the operation, the hot oil spouts out of the pan, causing burns.

IMPORTANT

- For more information on the which oil to be used, see "6.6.1 USE OF FUEL AND LUBRICATING OIL ACCORDING TO TEMPERATURES." Using other oil than those specified may shorten the life of the engine. Be sure to refill with the specified oil.
- Keep the engine oil at the appropriate level. The oil level being too high will result in too much oil consumption and this tends to increase the oil temperature, deteriorating the oil faster. The oil level being too low may burn out the engine.
- Be careful not to let any foreign substance go into the filler opening when refilling with the oil.

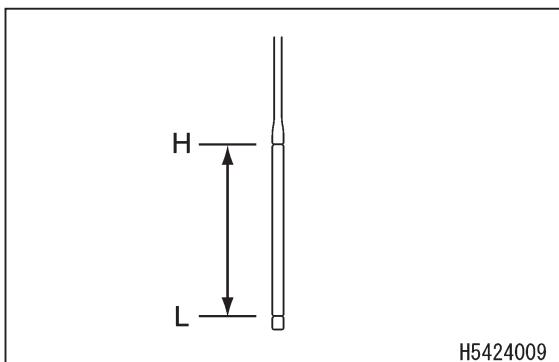
- Stop the machine at levelled location.
- Open the access hatch in the right-hand machinery cover.

3. Pull the oil level gauge (G) out and wipe the oil with a disposable cloth.



4. Insert the oil level gauge (G) into the gauge guide and pull it out.

5. If the oil level is between the "H" mark and "L" mark on the oil level gauge (G), the oil level is normal.



6. If the oil level is lower than the "L" mark, remove the filler cap (F) and refill with the engine oil from the filler opening.

☞ Refill with the engine oil so that the oil level will be in the middle of the "H" and "L" marks on the oil level gauge (G).

7. After refilling with the oil, securely install the oil level gauge (G) and the filler cap (F).

8. Close the access hatch.

[3] CHECK / ADD FUEL

⚠ DANGER

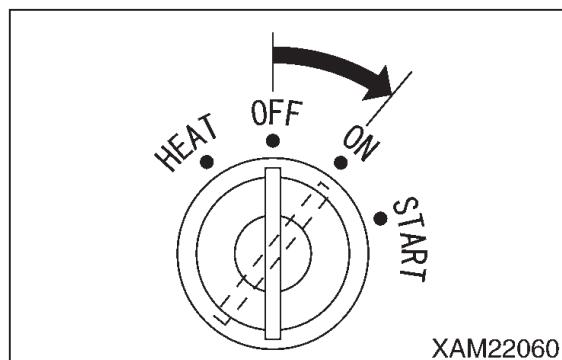
- Be extremely careful with fire such as cigarette.

- Be sure to stop the engine when refuelling. If refuelling was done with the engine in operation, the fuel spilled on the section where it gets hot such as muffler can catch fire.
- Over-refilling may cause fuel spill. Refuel to the level slightly lower than the specified upper limit level. If the fuel spills, be sure to thoroughly wipe it off.
- Be sure to close the tank cap after refuelling.

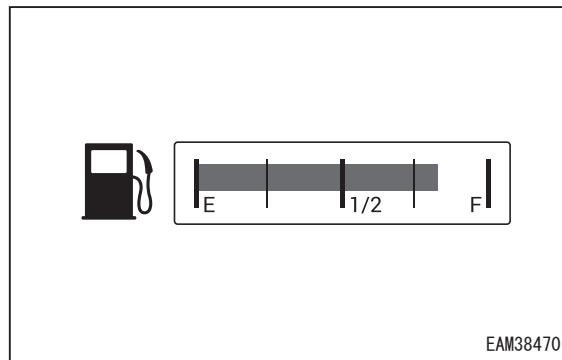
⚠ CAUTION

- For more information on the which oil to be used, see "6.6.1 USE OF FUEL AND LUBRICATING OIL ACCORDING TO TEMPERATURES."
- Be careful not to let any foreign substance go into the filler opening when refuelling.

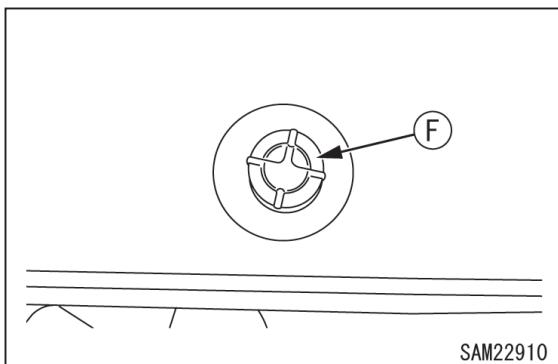
1. Turn the starter switch to the "ON" position.



2. Looking at the fuel gauge on the monitor panel, check if the fuel is filled to almost full (around "F").



- If the fuel level is low, remove the tank cap (F) on the top of the fuel tank and refuel from the filler opening while watching the fuel gauge.



- After refuelling, turn the tank cap (F) to securely close it.
- Fill the fuel tank to full after finishing the work for the day.

[4] CHECK / CLEAN WATER SEPARATOR

⚠ WARNING

- The water separator pot has fuel (diesel oil) inside. Be extremely careful of fire such as cigarette when cleaning the water separator pot.
- If the fuel spills when the water separator pot is removed, thoroughly wipe it off.

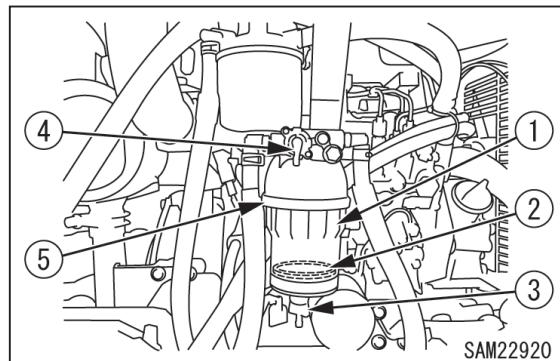
⚠ CAUTION

- Water or dust accumulated inside the water separator pot will cause engine failure. Check inside the pot and remove any water or dust accumulated inside.
- If water remains in the water separator pot, it is assumed that much water is also mixed in the fuel tank. See “6.18.13[6] DRAIN CONTAMINANT WATER/DEPOSITS IN FUEL TANK” and eliminate water and dust mixed into the fuel tank.

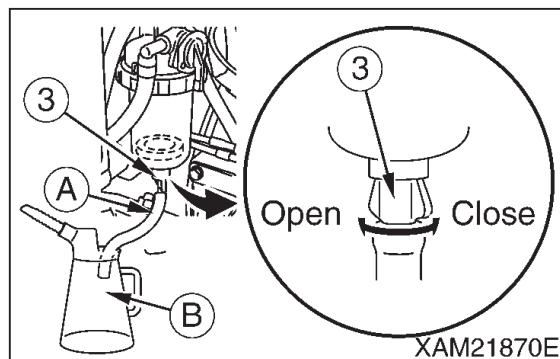
- Stop the machine at levelled location.
- Open the access hatch in the right-hand machinery cover.

- Check the water separator pot (1) for any water or dust in the pot and verify if the red float (2) in the pot has not come up from the bottom.

The red float (2) in the pot (1) coming up indicates that the water has mixed in.



- If there is water accumulated in the pot (1), drain the water in the pot using the following procedure.
 - Remove the machinery cover as described in “4.2 REMOTE CONTROL SYSTEM.”
 - Connect the hose (A) to the drain outlet of the valve (3) at the bottom of the pot (1) and to the container (B) to receive drained fuel.



- Turn the valve (3) at the bottom of the pot (1) counterclockwise (left) to loosen and drain the fuel until the red float (2) in the pot (1) sinks to the bottom.
- When the fuel drain has completed, turn the valve (3) at the bottom of the pot (1) clockwise (right) to tighten.
- Disconnect the hose (A) connected to the drain outlet of the valve (3).
- Reattach the machinery cover as described in “4.2 REMOTE CONTROL SYSTEM.”

- Close the access hatch.

[5] CHECK / ADD HYDRAULIC OIL

⚠ WARNING

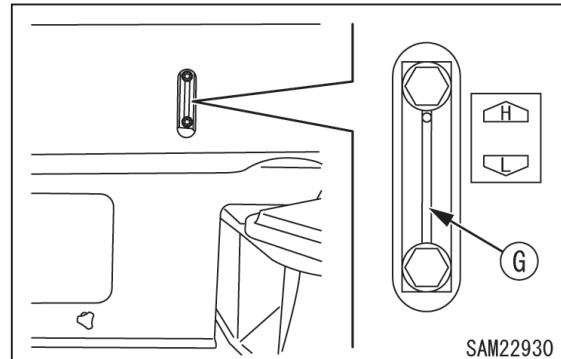
- The oil may spout out when the cap of the hydraulic oil tank is removed. Turn the cap slowly to let the inner pressure escape before removing.
- Do not refill with the oil to the level higher than the "H" (upper limit) of the level gauge. Too much oil may cause the oil to spout out of the air breather during travelling or crane operation, causing burns.
- Be careful not to let dust go in from the filler opening when refilling with oil.
- Securely close the tank cap after refilling with the oil. The tank cap may fall, and the hot oil may spout out, causing burns.

⚠ CAUTION

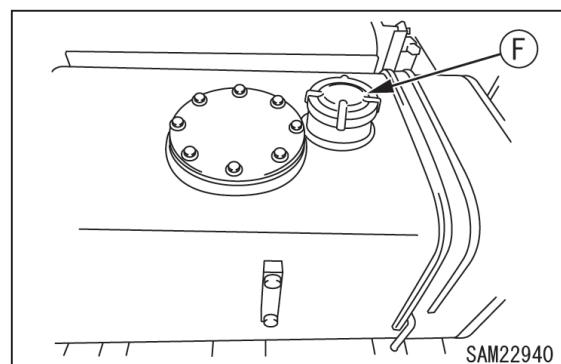
- For more information on the which oil to be used, see "6.6.1 USE OF FUEL AND LUBRICATING OIL ACCORDING TO TEMPERATURES."
- Be sure to put the machine in the travelling posture when checking the oil level. Checking the oil level in the working posture will cause overfilling since the oil in the cylinders has not returned to the tank.
- Be careful not to let dust go in from the filler opening when refilling with oil.

- Stop the machine at levelled location.

- Look at the oil level gauge (G) on the left machinery cover to check if the oil level is between "H" and "L".



- If there is not sufficient oil, refill with the hydraulic oil using the following procedure.
 - Remove the machinery cover as described in "4.2 REMOTE CONTROL SYSTEM."
 - Remove the filler cap (F) on the top of the hydraulic oil tank.



- Refill with the hydraulic oil from the filler opening (F) while looking at the oil level gauge (G).
- Securely close the filler cap (F) after refilling with oil.
- Reattach the machinery cover as described in "4.2 REMOTE CONTROL SYSTEM."

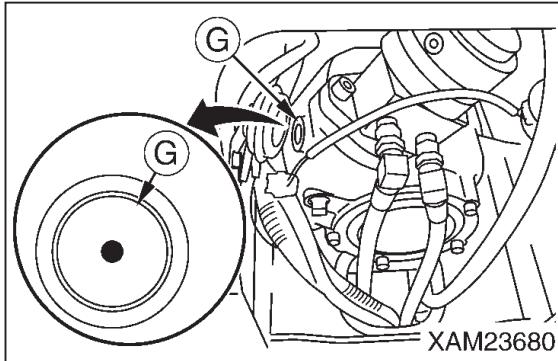
[6] CHECK / ADD SLEWING MOTOR REDUCTION GEAR CASE OIL

⚠ CAUTION

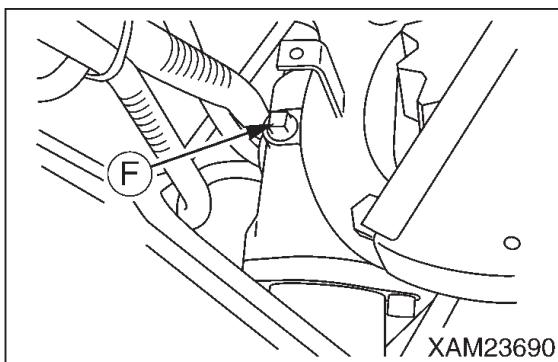
- For more information on the which oil to be used, see "6.6.1 USE OF FUEL AND LUBRICATING OIL ACCORDING TO TEMPERATURES."

- Use seal tape, etc. at the thread of the filler plug to stop the oil leak and securely tighten the plug after refilling with the oil.

1. Stop the machine at levelled location.
2. Go under the machine and check the site gauge (G) for checking oil level in the slewing reduction gear case. Verify that the oil is filled up to the centre of the site gauge (G).



3. If there is not sufficient oil, refill with the gear oil using the following procedure.
 1. See "5.2.13 OUTRIGGER SETTING" to rotate the rotary of the "outrigger [2]" outward.
 2. Remove the filler opening plug (F) at the back of the post and pour in oil from the filler opening.



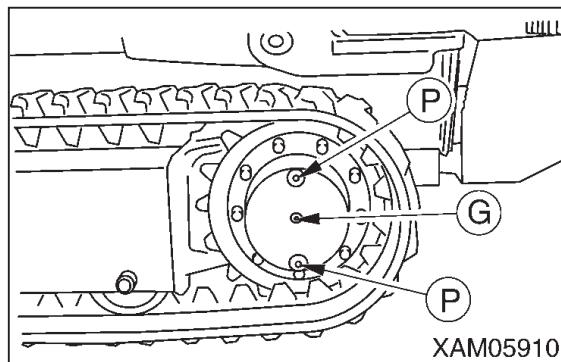
- ☞ Pour in the oil to the centre of the site gauge (G) from the filler opening.
- 3. After refilling with the oil, install the filler plug (F) and securely tighten the plug.
- 4. See "5.2.24 OUTRIGGER STOWING OPERATION" and rotate the rotary of the "outrigger [2]" inward and stow.

[7] CHECK / ADD TRAVELLING MOTOR REDUCTION GEAR CASE OIL

⚠ CAUTION

- For more information on the which oil to be used, see "6.6.1 USE OF FUEL AND LUBRICATING OIL ACCORDING TO TEMPERATURES."
- Use seal tape, etc. at the thread of the oil level check plug to stop the oil leak and securely tighten the plug after refilling with the oil.

1. Move the machine forward and backward so that one of the two drain plugs (P) of the travelling motor reduction gear case will come right under.

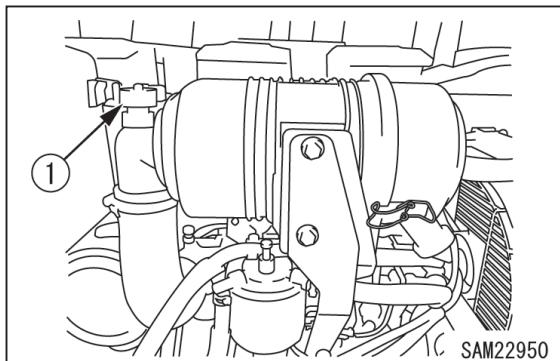


2. Remove the oil level check plug (G) of the travelling motor reduction gear case to check if the oil will come out of the plug hole.
3. If there is no sufficient oil, remove the top drain plug (P) and pour in gear oil from the plug hole.
 - ☞ Pour in the gear oil until the oil comes out of the oil level check plug (G).
4. Install the oil level check plug (G) and upper drain plug (P) and securely tighten them after checking and refilling with the oil.

[8] CHECK DUST INDICATOR

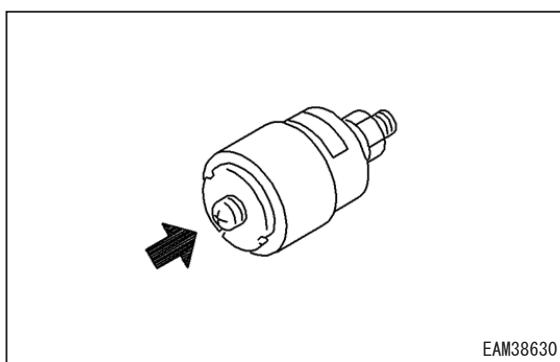
1. Remove the machinery cover as described in "4.2 REMOTE CONTROL SYSTEM."

2. Inspect the dust indicator (1) on the air cleaner to confirm that the red piston is not visible in the transparent section.



3. If the red piston is visible, clean or replace the element immediately.

For more information on cleaning the element, see “6.18.13 [4] INSPECT / CLEAN / REPLACE AIR CLEANER.”



4. After inspecting, cleaning, or replacing, press the knob on the dust indicator (1) to return the red piston to its original position.

5. Reattach the machinery cover as described in “4.2 REMOTE CONTROL SYSTEM.”

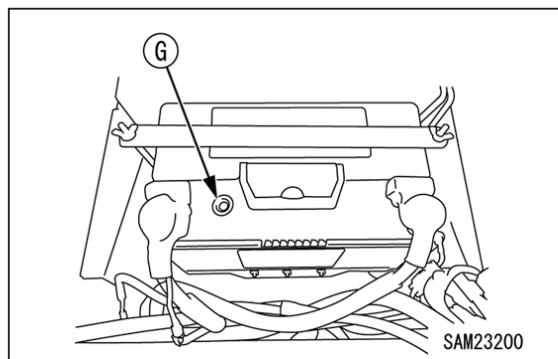
[9] CHECK BATTERY CHARGE LEVEL

⚠ WARNING

- The electrolyte generates combustible gas and presents explosion hazard. Do not bring any fire close to the electrolyte.
- The electrolyte is a hazardous substance. Avoid contact with eyes or skin. Should it come into the contact with eyes or skin, wash the affected area with plenty of water and consult a physician.

Check the status by the colour displayed on the meter on the top of the battery.

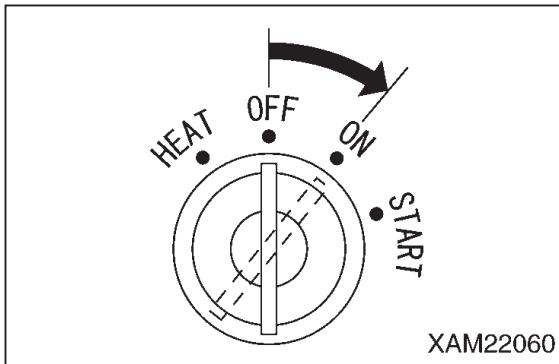
- The meter indications are as follows:
- Green: Normal, with no problems.
- Black: Charge is low. Recharge the battery.
- White: Inspect the exterior.



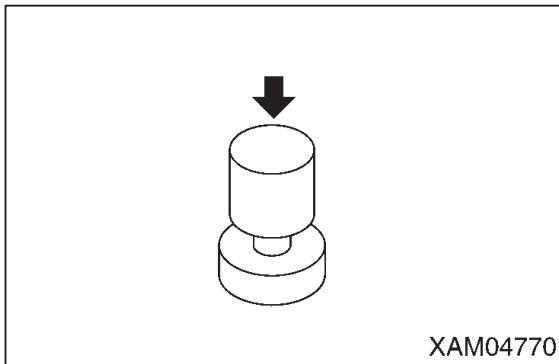
- ☞ If the meter indication remains black even after the battery has been recharged, the battery may be at the end of its life cycle and therefore should be replaced.
- ☞ If the meter indication is white, check that the casing is not damaged and there is no fluid leakage. Replace if it is damaged.
- ☞ Even if no exterior damage is visible, it may be damaged internally or it may be at the end of its life cycle and therefore should be replaced.

[10] CHECK HORN OPERATION

1. Turn the starter switch to the "ON" position and check the followings.

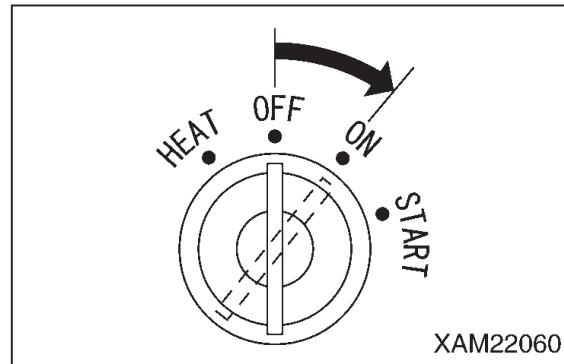


2. Press the horn switch to verify that the horn sounds.

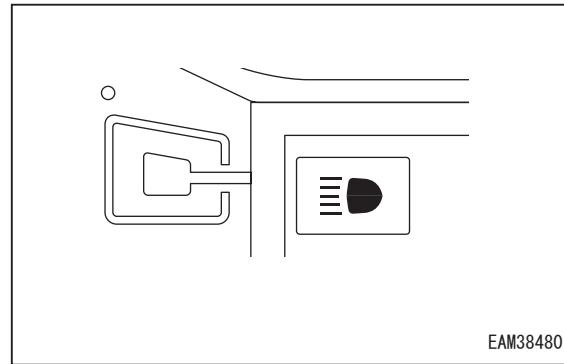


[11] CHECK WORKING LIGHT OPERATION

1. Turn the starter switch to the "ON" position and check the followings.



2. Push the working light switch in the back and verify that the pilot lamp of the switch section and the working light on front of the machine lights up.

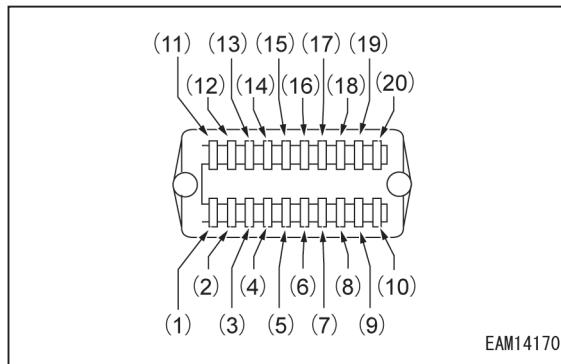


[12] CHECK FUSE BOX

⚠ WARNING

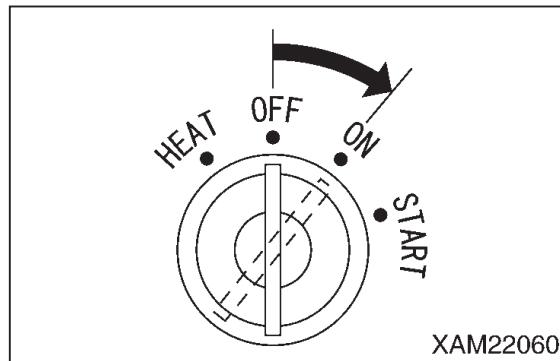
If fuses are brown frequently or if you find the trace of a short circuit created in the electrical wiring, be sure to find the cause and fix the problem.

Check the fuse at the lower section of the instrument panel for damage and meltdown and if the fuse of specified capacity is being used.

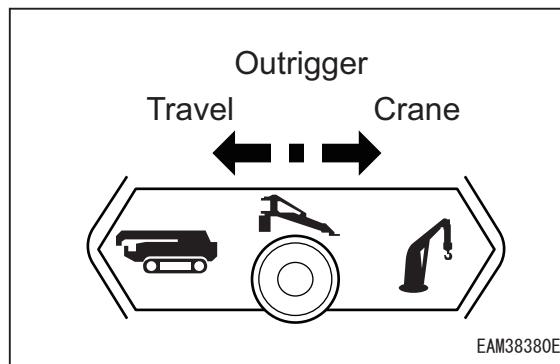


[13] CHECK OUTRIGGER DISPLAY OPERATION

1. Turn the starter switch to the "ON" position.



2. Operate the work selector switch (travel/outrigger/crane) on the outrigger operation panel to the "Outrigger" position.



3. Verify that the red of the working status lamp lights up.

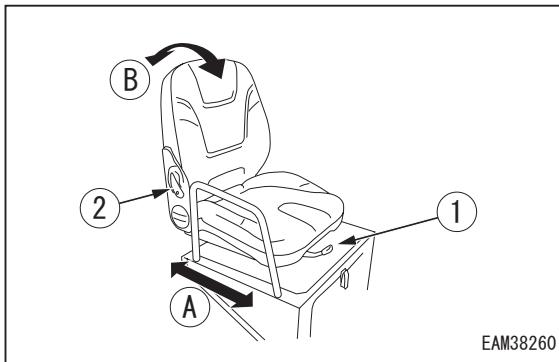
[14] ADJUST OPERATION SEAT

⚠ WARNING

- Adjust the operation seat before operation or when the operator changes.
- Press your back against the back of the operation seat and adjust the seat so that you can fully step on the acceleration pedal

[FORWARD/BACKWARD ADJUSTMENT OF THE SEAT]

1. While pushing the slide adjusting lever (1) to the left, set the seat to the desired position.



2. Release your hand from the slide adjusting lever (1).

☞ The forward/backward slide adjustment distance is 120 mm in 6 steps.

[RECLINING ADJUSTMENT]

⚠ CAUTION

Watch the space in the back while adjusting the angle when reclining the backseat backward.

1. While pushing the reclining adjusting lever (2) forward, set the backseat to the desired angle.

2. Release your hand from the reclining adjusting lever (2).

☞ The reclining adjustment angle is 75 degrees in 7 steps forward and 23 steps in backward.

6.12.1.3 POST-START INSPECTION - AFTER STARTING ENGINE

Check the followings in this section after starting the engine and before starting the first work every day.

⚠ CAUTION

The checkups described in this section should be carried out after starting the machine.

See “5.2.2 STARTING ENGINE” and later to execute the engine startup, travelling operations, outrigger operations and crane operations.

[1] CHECK / ADJUST RUBBER TRACK TENSION

⚠ CAUTION

- Set the outriggers and raise the rubber track for about 50 mm from the ground when checking/adjusting the tension of the rubber tracks.
- The standard tension of the rubber track is that the clearance between the wheel tread of the track roller at centre and the shoulder of the rubber track is 5 to 10 mm.
- If the tension is not sufficient even after injecting the grease, the rubber track or the sealing of the tension adjustment cylinder needs to be changed. Contact us or our sales service agency for the judgement of whether to replace, repair, or keep the rubber track.

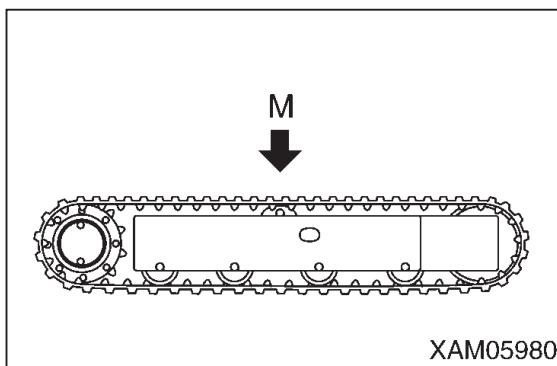
The rubber tracks are worn out differently depending on the working conditions and soil quality. Regularly check the wear and tension of the rubber tracks.

Especially, with the new machine or when a new part was installed, "initial slack" appears with 5 to 30 hours of operation after adjusting the tension to the specified value.

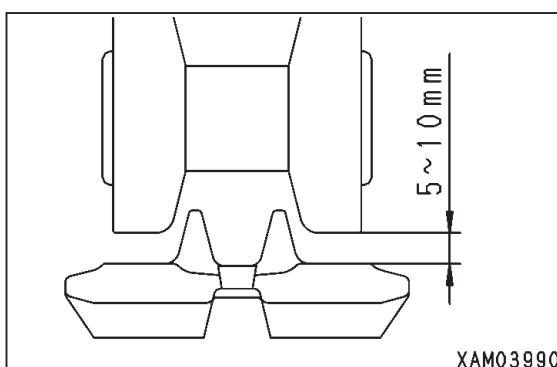
Adjust the tension frequently until the period of "initial slack" passes. This will prevent "rubber track from coming off due to insufficient tension on the rubber track".

[TENSION CHECK]

1. Move the left and right crawlers so that the junction of the rubber track (indicated by M) comes to the top centre between the axles.



2. See "5.2.13 OUTRIGGER SETTING" to set the outriggers and raise the crawlers for about 50mm from the ground.
3. Measure the clearance between the wheel tread of the track roller at centre and the shoulder of the rubber track.



☞ The clearance of 5 to 10 mm indicates the standard tension.

4. If the tension is out of the standard range, see "Tension Adjustment" below to make adjustments.

[TENSION ADJUSTMENT]

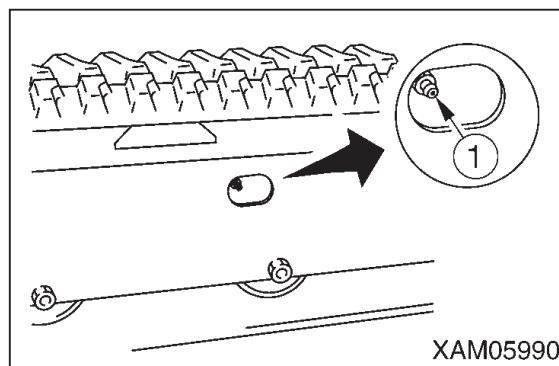
If the "tension check" of the rubber track found the tension lower than standard tension of the rubber track, make adjustments as described below.

Working with the loose rubber track (the tension of the rubber track at 15 mm or more) will cause run-off or early wear of the core metal.

[LOOSE TENSION (INCREASE TENSION)]

Have a grease gun (pump) ready.

1. Inject the grease from the grease valve (1) using the grease gun.



2. Perform the following tasks to verify the proper tension.
 1. See "5.2.24 OUTRIGGER STOWING OPERATION" to stow the outriggers and lower the machine on the ground.
 2. Move the machine forward/backward.
 3. See "5.2.13 OUTRIGGER SETTING" to set the outriggers and raise the crawlers again for about 50mm from the ground.
 3. Perform the "tension check" of the rubber track again. If the tension is not appropriate, make another adjustment.
 4. See "5.2.24 OUTRIGGER STOWING OPERATION" to stow the outriggers and lower the machine on the ground.

[TIGHT TENSION (DECREASE TENSION)]

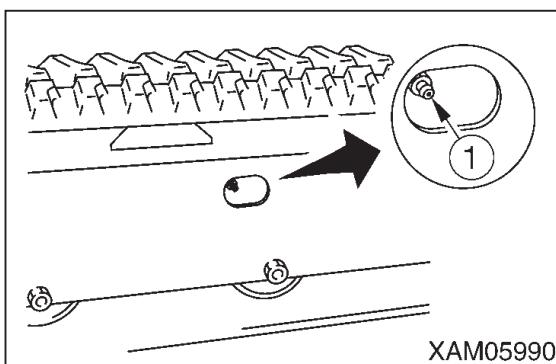
⚠ WARNING

Inside the rubber track tension adjustment device has the grease sealed. The grease is under high pressure due to the tension of the rubber track.

Making adjustments without observing the followings may cause the grease valve to fly away, resulting in serious accidents.

- Do not loosen the grease valve for tension adjustment for more than 1 turn. The grease valve may pop out.
- Do not place yourself right in front of the grease valve when adjusting the tension to avoid any danger.

1. Slowly loosen the grease valve (1) to drain the grease.



☞ When loosening the grease valve (1), do not loosen more than for one turn.

2. If the grease is not drained easily, perform the following to drain the grease.
 1. See "5.2.24 OUTRIGGER STOWING OPERATION" to stow the outriggers and lower the machine on the ground.
 2. Move the machine forward/backward.
 3. See "5.2.13 OUTRIGGER SETTING" to set the outriggers and raise the crawlers again for about 50mm from the ground.
3. Tighten the grease valve (1).

4. Perform the "tension check" of the rubber track. If the tension is not appropriate, make another adjustment.

5. See "5.2.24 OUTRIGGER STOWING OPERATION" to stow the outriggers and lower the machine on the ground.

[2] CHECK RUBBER TRACKS FOR DAMAGE AND WEAR

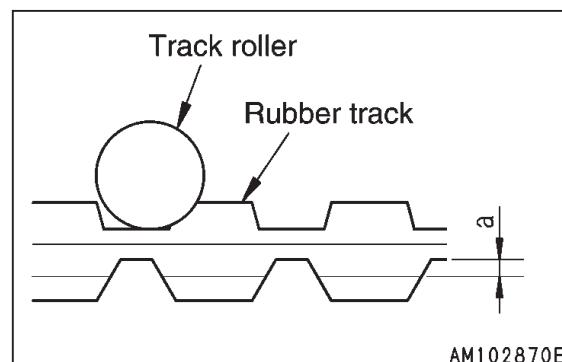
⚠ CAUTION

Contact us or our sales service agency for determining whether to replace, repair, or keep the rubber track.

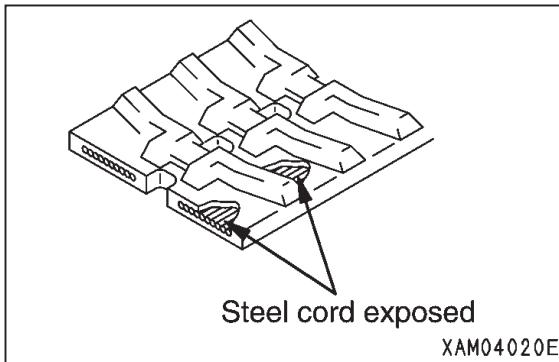
The following condition requires the repair or replacement of the rubber track. Ask us or our sales service agency for repair/replacement.

[LUG HEIGHT]

- When the lug height "a" decreases with wear, the traction force drops. Replace the rubber track when the lug height decreases to 5 mm or lower with a new rubber track.

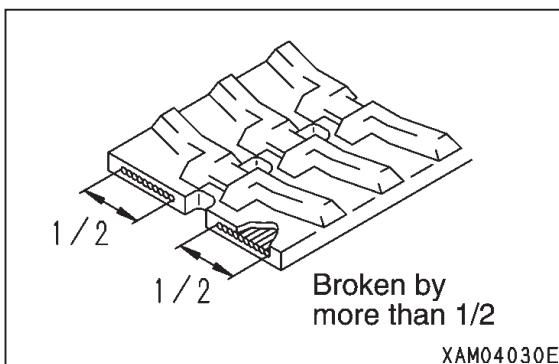


- When the lug is worn out and the steel cord inside the rubber track is exposed for more than 2 links, replace the rubber track with a new one.



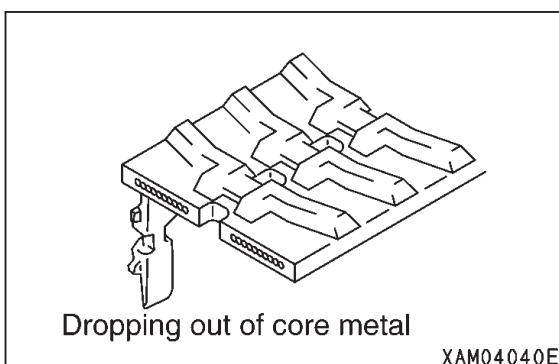
[BROKEN STEEL CORD]

- If more than half of the steel cord layer is broken on one side, replace the rubber track with a new one.



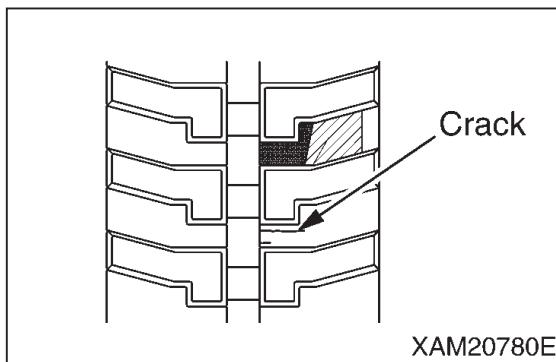
[FALLEN CORE METAL]

- If the core metal of the rubber track is fallen out at more than 1 location, change the rubber track with a new one.



[CRACKS]

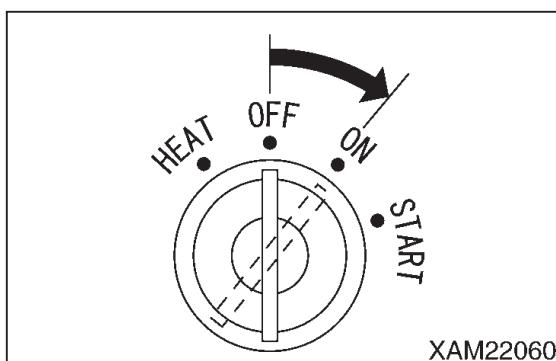
- If there is a crack between rubber track lugs, change the rubber track with a new one.



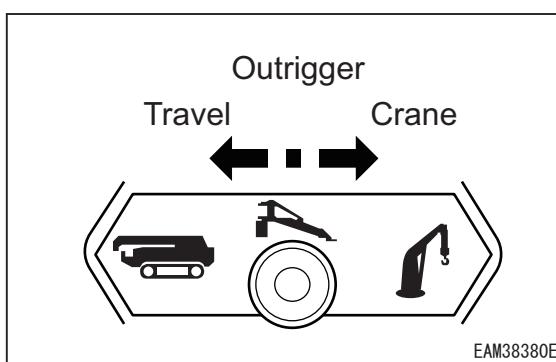
[3] CHECK OUTRIGGER SAFETY DEVICE OPERATION

[CHECKING OPERATION OF CRANE INTERLOCK FUNCTION]

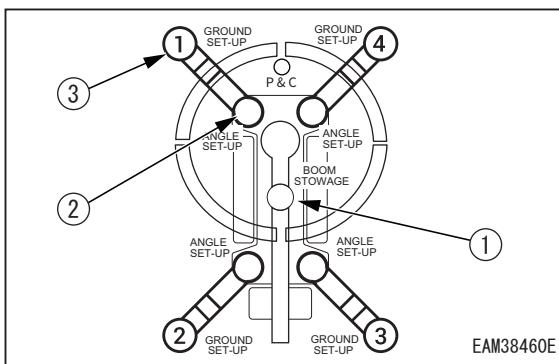
- Turn the starter switch to the "ON" position.



- Operate the work selector switch (travel/outrigger/crane) on the outrigger operation Panel to the "Outrigger" position.

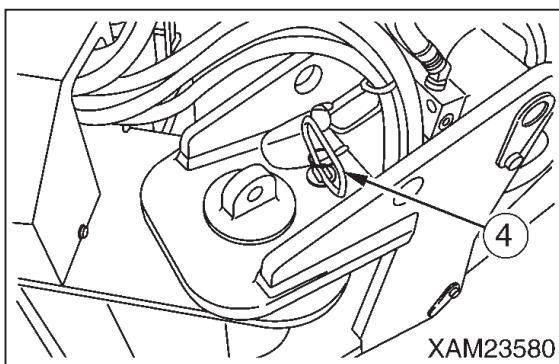


3. Verify that only the boom stowage lamp (1) (green) remains ON on the outrigger display.



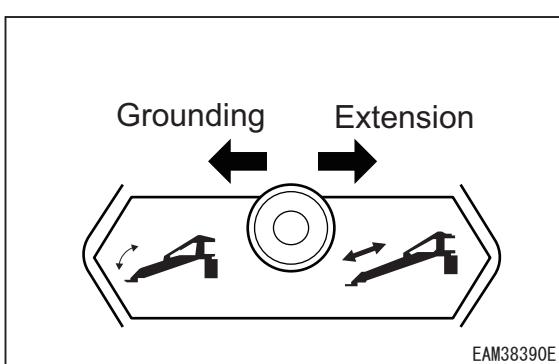
4. Rotate the rotary of all the four outriggers outward and properly insert the position pin (4).

Verify that all the extension lamps (2) light up on the outrigger display.

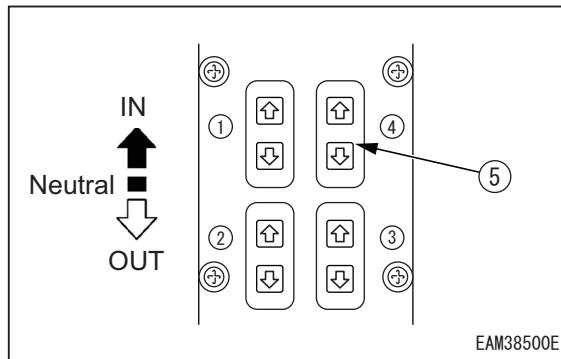


☞ Verify that the position pin (4) is properly inserted after outrigger rotary extension operation.

5. Push down the work selector switch (outrigger grounding/extension) on the outrigger operation panel to the left.

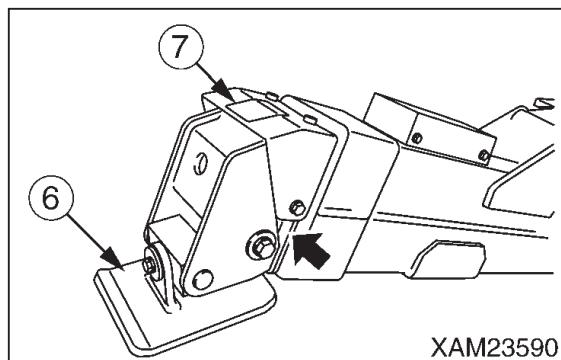


6. Operate the outrigger grounding switch (5) on the outrigger operation panel to "OUT" position and set all the four outriggers. Then set the outrigger foot securely. Verify that all the ground set-up lamps (3) on the outrigger display light up.

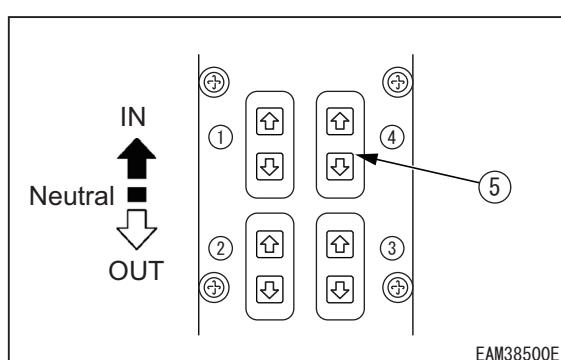


⚠ CAUTION

If any of the ground set-up lamps (3) is lit red, remove the cover (7) of the outrigger foot (6) and check if there is any foreign object engaged in the bending section.



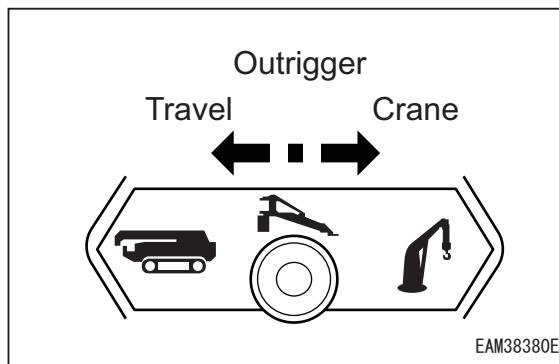
7. Operate one of the four outrigger grounding switches (5) to "ON" position and raise the outrigger foot above the ground.



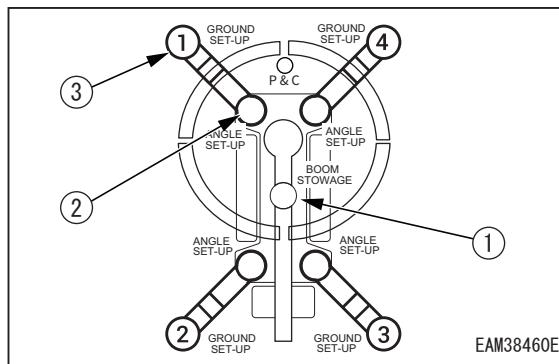
8. Operate the work selector switch (travel/outrigger/crane) on the outrigger operation panel to the "Crane" position.
9. Operate the crane derricking lever to the "RAISE" side and verify that the crane does not operate.
 - ☞ Perform the tasks described in the step 6 to 8 to all the four outriggers.

[CHECKING OPERATION OF OUTRIGGER INTERLOCK FUNCTION]

1. Set all the four outriggers.
2. Operate the work selector switch (travel/outrigger/crane) on the outrigger operation panel to the "Crane" position.

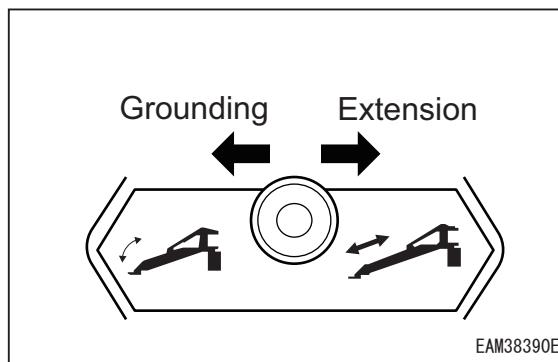


3. Operate the crane derricking lever to the "RAISE" side and raise the boom until the boom stowage lamp (1) on the outrigger display turns red.

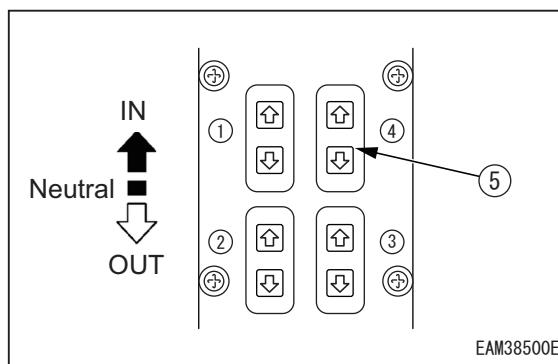


4. Operate the work selector switch (travel/outrigger/crane) on the outrigger operation panel to the "Outrigger" position.

5. Push down the work selector switch (outrigger grounding/extension) on the outrigger operation panel to the right.



6. Operate the outrigger grounding switch (5) on the outrigger operation panel to the "IN" position and verify that the outriggers do not operate.

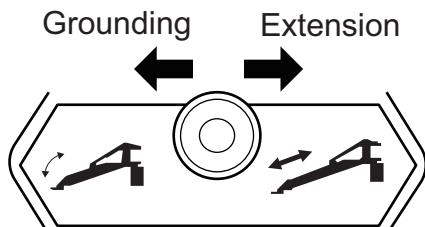


[4] CHECK OUTRIGGER OPERATION

⚠ WARNING

Be sure to see “5.2.13 OUTRIGGER SETTING” and “5.2.24 OUTRIGGER STOWING OPERATION”, and strictly observe the methods described and cautions given when checking operations of the outriggers.

1. Push down the work selector switch (outrigger grounding/extension) on the outrigger operation panel to the right.

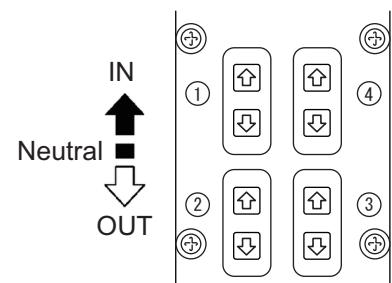


EAM38390E

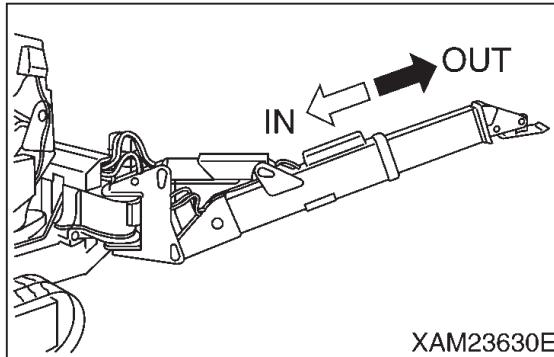
2. Verify that the outrigger inner box extends smoothly when the outrigger extension switch is pushed down to the "OUT" position. Also, verify that the inner box retracts smoothly when the outrigger extension switch is pushed down to the "IN" position.

When doing the above, check for any

abnormal noise generated by part of the outrigger.
Operate the other switches likewise and check the operations.
If there is any abnormality, repair.



EAM38450E

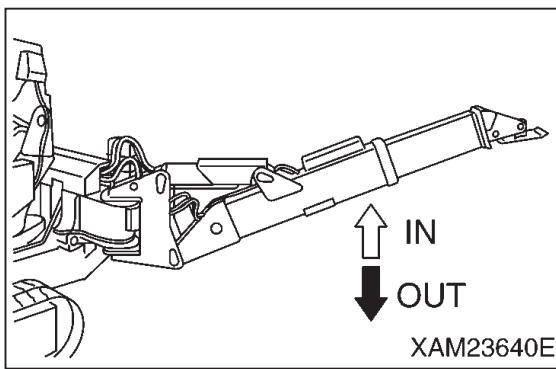
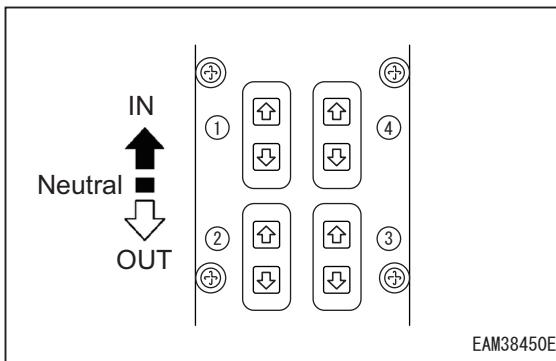


XAM23630E

3. Push down the work selector switch (outrigger grounding/extension) to the left.
4. Verify that the outrigger lowers smoothly when the outrigger grounding switch is pushed down to the "OUT" position. Also, verify that the inner box rises smoothly when the outrigger grounding switch is pushed down to the "IN" position.

When doing the above, check for any

abnormal noise generated by part of the outrigger.
Operate the other switches likewise and check the operations.
If there is any abnormality, repair.



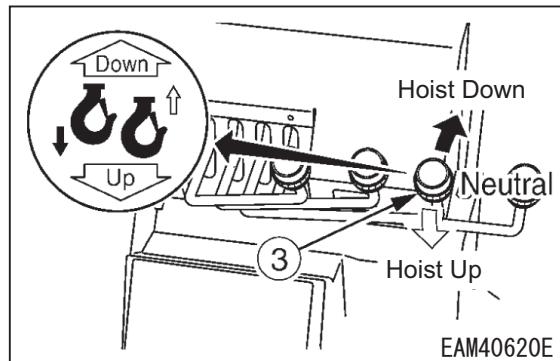
[5] CHECK CRANE OPERATION

⚠ WARNING

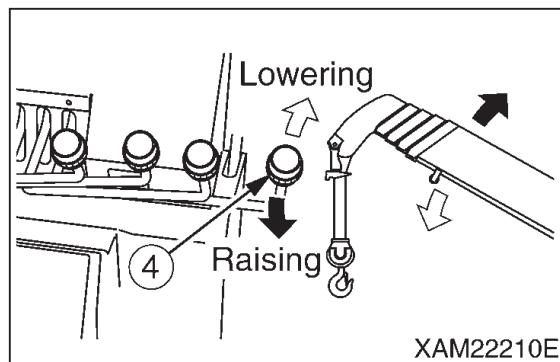
Be sure to set the outriggers by the maximum extension state by referring to “5.2.13 OUTRIGGER SETTING” before checking the crane operations.

Be sure to refer to the sections between “5.2.16 BEFORE CRANE OPERATIONS” and “5.2.23 CRANE STOWING OPERATION”, and strictly observe the methods described and cautions given when checking crane operations.

1. Operate the winch lever (3) to "DOWN" side to leave the hook block from the stow position.

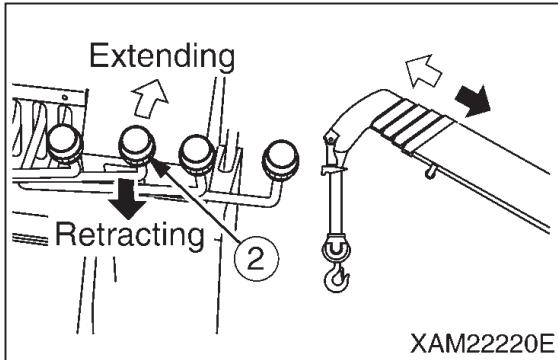


2. Verify that the boom rises smoothly when the boom derricking lever (4) is operated to "RAISE" side (pull toward you). Also, verify that the boom lowers smoothly when the boom derricking lever (4) is operated to "LOWER" side (push forward). When doing the above, check for any abnormal sound emitted by part of the boom or from the boom derrick cylinder. If there is any abnormality, repair.

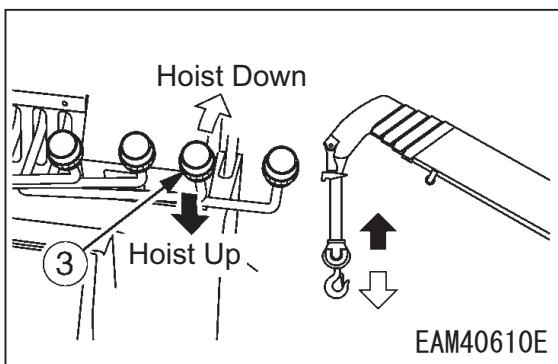


3. Verify that the boom extends smoothly when the boom telescoping lever (2) is operated to "EXTEND" (push forward). Also, verify that the boom retracts smoothly when the boom telescoping lever (2) is operated to "RETRACT" (pull toward you).

When doing the above, check for any abnormal sound emitted by part of the boom or from the boom telescoping cylinder.
If there is any abnormality, repair.



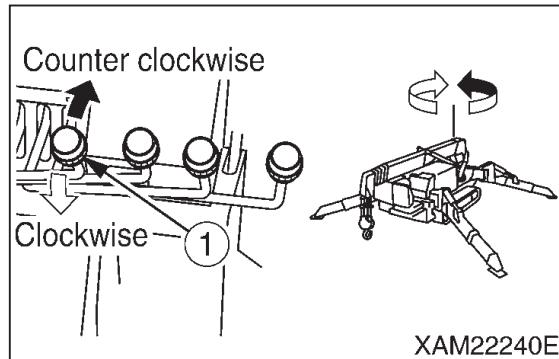
- Verify that the hook is wound down smoothly when the winch lever (3) is operated to "DOWN" (push forward). Also, verify that the hook is wound up smoothly when the winch lever (3) is operated to "UP" side (pull toward you). When doing the above, check for any abnormal sound emitted by part of the boom or from the winch motor. If there is any abnormality, repair.



- Verify that the crane smoothly slews counterclockwise (left) when the slewing lever (1) is operated to "LEFT" side (push forward). Also, verify that the crane smoothly slews clockwise (right) when the slewing lever (1)

is operated to "RIGHT" side (pull toward you).

When doing the above, check for any abnormal sound emitted nearby the post. If there is any abnormality, repair.

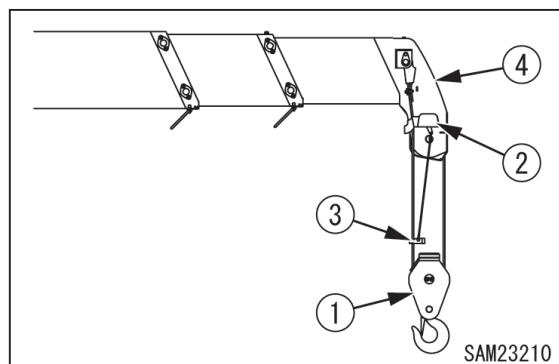


[6] CHECK OVERWINDING DETECTOR OPERATION

Overwind the hook block (1), and hoist up the hook with winch and extend the boom, and verify that the buzzer sounds, the hook hoisting up operation and boom extending operation stop.

If these events do not happen, the overwinding detector may be faulty.

If the alarm does not stop, the overwinding detector may be faulty or the circuit may be open.



[7] CHECK MOMENT LIMITER OPERATION

⚠ WARNING

If you find any abnormality with the moment limiter, immediately contact us or our sales service agency.

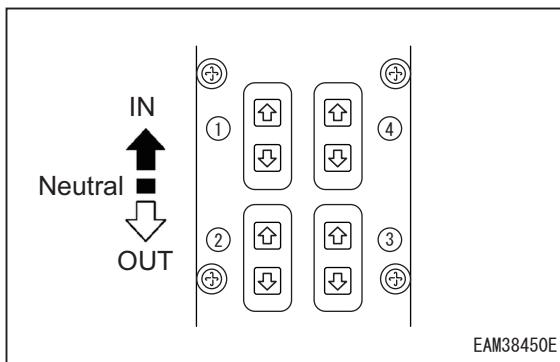
1. Turn the starter switch to the "ON" position.
2. Check with the working status lamp. The red of the lamp lights up for 2 seconds and then the green lights up.
3. Check the moment limiter display unit. Verify that no error code is displayed at the "RATED TOTAL LOAD" display on the display panel.
4. Start the engine and operate the crane as follows to verify if the moment limiter properly displays the value.

5. Operate the crane until the moment limiter display values indicate the boom length is "7.7 m" (booms (1) + (2)) and boom angle is "60.5 degrees", then measure the "boom angle" and "working radius". If the measured value(s) differ from the moment limiter display value, contact us or our sales agency.

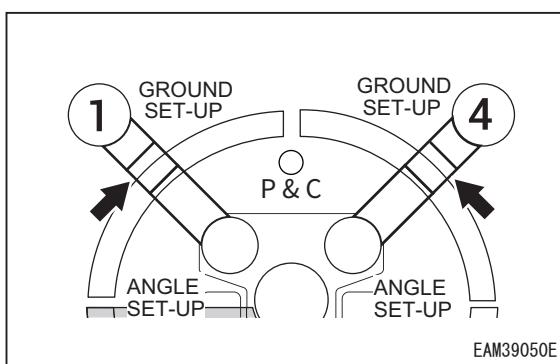
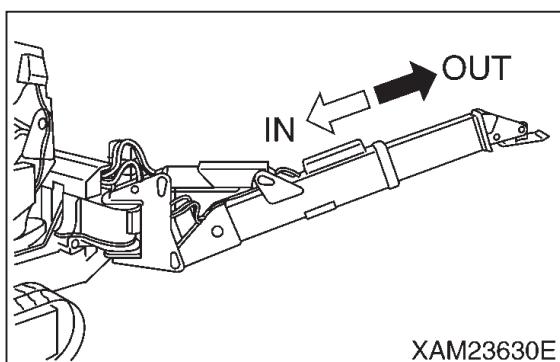
Crane Operation and Displayed Parameter	Value Displayed on Moment Limiter
Displayed "boom length" with the boom length at minimum	4.7m
Displayed "boom length" with the boom length at maximum	16.5m
Displayed "working radius" with the boom length of "7.7 m" (2-row booms) and boom angle of "60.5 °"	3.5±0.1m
Displayed "ACTUAL LOAD" when the weight of the known weight was hoisted <ul style="list-style-type: none"> • Must be equal to the total weight of weight + rigging • Note that it may show some errors depending on the boom conditions. 	Actual load

[8] CHECK OUTRIGGER EXTENSION POSITIONS

Start the engine, execute each of the "MID" and "MAX" outrigger extension operations, and verify that the outrigger display on the moment limiter display section is proper in both case.



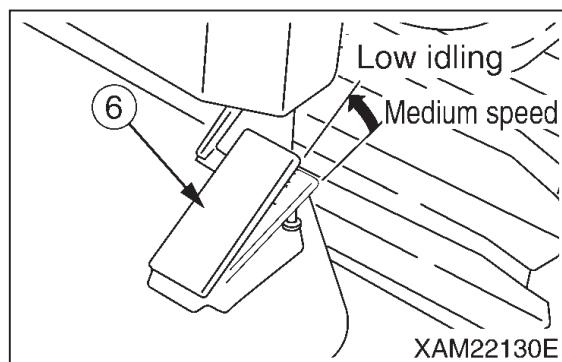
- ☞ Look to the sticker (MID, MAX) affixed to the top of the inner box when adjusting the outrigger extension.



- ☞ Look to the sticker (MID, MAX) affixed to the top of the inner box when adjusting the outrigger extension.

[9] CHECK ENGINE EXHAUST GAS COLOUR, NOISE AND VIBRATION

1. Leave your foot away from the acceleration pedal (6). Keep the engine idling and continue the operation with no load for about 5 minutes.



2. Verify that the engine exhaust gas colour is either transparent or slightly blue. Also, check for abnormal noises and vibrations. If there is any abnormality, repair.

6.13 REMOTE CONTROL SYSTEM INSPECTIONS

The following remote control system inspections and inspections must be performed before starting the engine.

⚠ WARNING

Do not start the engine until the following remote control functions have been verified for proper operation. The remote control functions must operate properly before starting the engine.

If a failure is noticed during inspection, repair it or contact us or our sales service agency for service.

6.13.1 BEFORE TURNING ON TRANSMITTER

The following checks must be performed before the transmitter is turned on. Be sure the Engine Starter Switch is in the OFF position.

⚠ WARNING

Verify that the Engine Starter Switch is in the OFF position before performing the following inspections. The Engine Starter Switch must be in the OFF position to prevent accidental starting of the engine.

Perform the following inspections while the transmitter power is off:

- Inspect the operation levers, operation switches, and exterior to check that they are not covered in oil or other dirt. Clean with a clean cloth.
- Check for foreign material, such as particles of small stones or sand, caught in small openings near the operation levers and/or switches.

⚠ WARNING

Do not operate the machine if foreign material prohibits movement of operation levers and the accelerator lever. The operation levers and the accelerator lever must be free to operate for proper operation of the machine.

- Check for any damage to the transmitter case or rubber covers of the operation levers and operation switches.

⚠ WARNING

Do not operate the transmitter if its case, the rubber covers, operation levers, or operation switches are damaged. Damage to these items may cause internal component damage and/or electrical failure.

- Check the movement of each operation lever and operation switch for smooth operation and free movement and return to the NEUTRAL position when released. Repair any lever or switch immediately before returning to operation.

⚠ WARNING

Do not operate the machine using the transmitter if the levers do not return to the NEUTRAL position freely. Levers must return to the NEUTRAL position freely for proper operation of the transmitter.

- Open the battery cover and check that the battery is installed in the correct direction. If the battery is not installed correctly, install it again. If it is not installed correctly, internal devices of the transmitter may malfunction, causing the crane to perform unexpected operation and resulting in a serious accident.

- Check if there is any foreign matter such as a metal or paper in the electrode of the battery.

If found, remove such particles completely. Otherwise, an electric shock or fire may be caused.

6.13.2 AFTER TURNING ON TRANSMITTER

After the transmitter is powered on, perform the following checks:

Check that the power is turned on and the display is functioning properly. There is a risk of incorrect operation or serious accidents occurring if the display is not displayed.

6.13.3 AFTER STARTING ENGINE

The following remote control system inspections and inspections must be performed after the engine starts.

⚠ WARNING

Do not operate the machine until the following remote control functions have been verified for proper operation. The remote control functions must operate properly for proper operation of the machine.

If a failure is noticed during inspection, repair it or contact us or our sales service agency for service.

6.13.3.1 CHECKING ENGINE START OPERATION

Verify that the boom and outriggers are completely in the stowed position.

⚠ WARNING

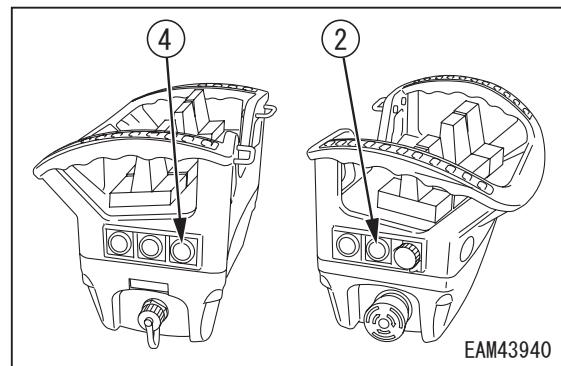
- Do not start the engine if the boom and outriggers are not in the stowed position. The boom and outriggers must be in the stowed position before operating the transmitter for proper operation of the machine.**

- Do not operate the crane if a warning display appears on the transmitter.**

Always perform the "Pre-Start Inspection" before starting the engine or inspecting after starting.

Perform the following inspections while the transmitter power is "ON":

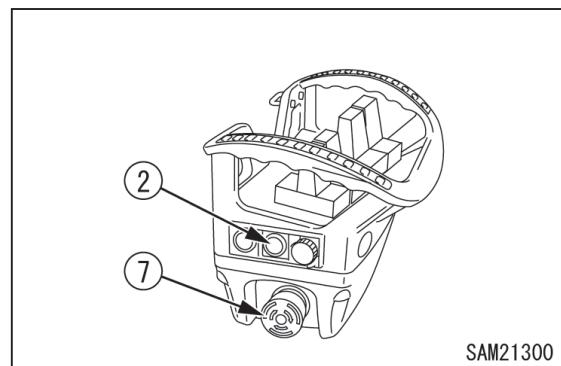
- Turn the starter switch ON.
In order to check startup using the transmitter, do not start the engine using the Starter Switch of the machine.
- Push the Horn Switch (4) and confirm that the horn sounds.



- Press the engine start/stop switch (2) while the engine is stopped, and confirm that the engine starts up.

6.13.3.2 CHECKING ENGINE STOP OPERATION

- Press the engine start/stop switch (2) while the engine runs and confirm that the engine stops.

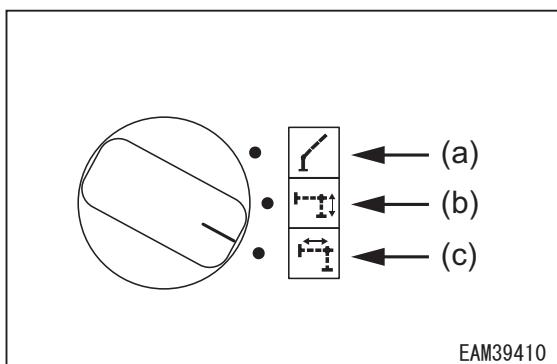


- Press the emergency stop (EMO)/remote control power OFF switch (7) while the engine runs and confirm that the engine stops.

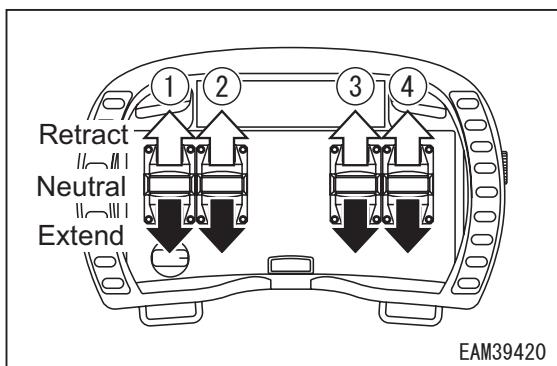
6.13.3.3 CHECKING OUTRIGGER OPERATION

Verify that the boom and outriggers are completely in the stowed position. Perform the following inspections with the engine running and the transmitter power turned on.

- Operate the operation mode selector switch to the "Outrigger extension" position(c).



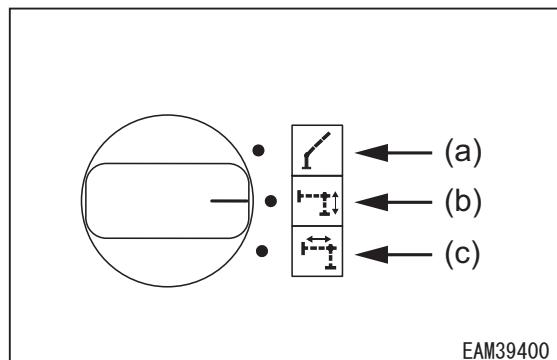
- Operate the various operation levers and verify that the outriggers operate accordingly for the respective lever operations.



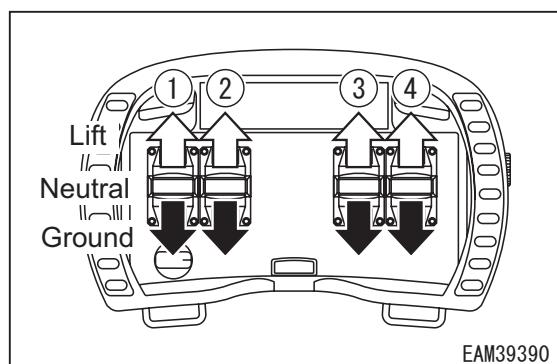
- Retract: The outrigger extension cylinder retracts and you can stow the outrigger inner box.
- Neutral: Release your finger from the switch. The switch returns to the "Neutral" position and the outrigger extension cylinder stops telescoping.

- Extend: The outrigger extension cylinder extends and you can extend the outrigger.
 - Also verify that the outriggers move at the appropriate operating speeds corresponding to how far the levers are moved.

- Operate the operation mode selector switch to the "Outrigger lifting and grounding" position(b).



- Operate the various operation levers and verify that the outriggers operate accordingly for the respective lever operations.



- Lift: The outrigger grounding cylinder retracts and you can stow the outrigger.
- Neutral: Release your finger from the switch. The switch returns to the "Neutral" position and the outrigger grounding cylinder stops telescoping.
- Ground: The outrigger grounding cylinder extends and you can set the outrigger.
 - Also verify that the outriggers move at the appropriate operating speeds corresponding to how far the levers are moved.

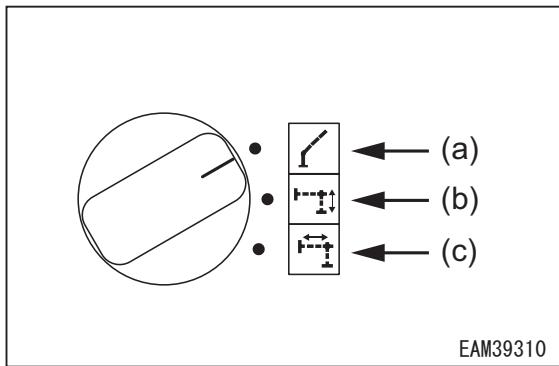
6.13.3.4 CHECKING CRANE OPERATION

⚠ WARNING

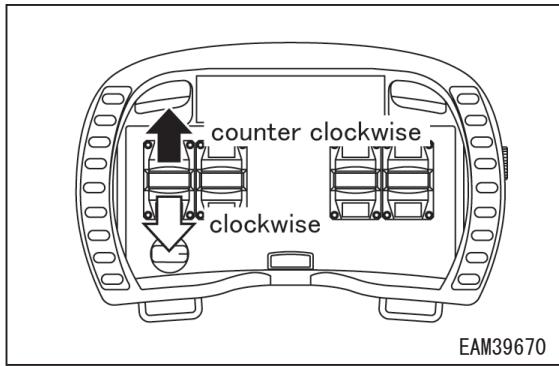
Verify that all outriggers are positioned correctly before operating the crane. All outriggers must be properly positioned before starting any crane operation.

Perform the following inspections with the engine running and transmitter power turned on.

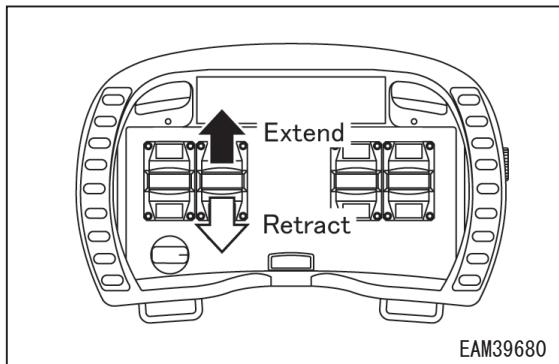
1. Switch the operation mode selector switch on the transmitter to "Crane."



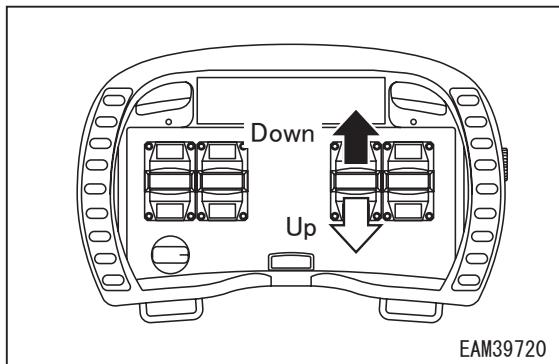
2. Move the operation lever (9) to the "clockwise (right)" and "counterclockwise (left)" side, and verify that the result corresponds to the lever direction. Slew continuously through at least 360° and verify that operations are normal.



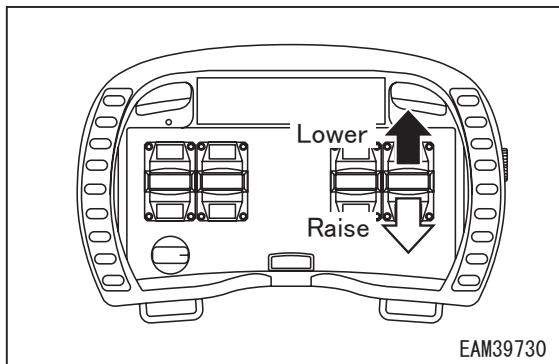
3. Move the operation lever (10) to the "Extend" and "Retract" side and check that the boom follows the lever operation.



4. Move the operation lever (11) to the "Down" and "Up" side, and check that the hook block follows the lever operation.



5. Move the operation lever (11) to "Up" side and check that the hook block stops by the overwinding detector.
6. Move the operation lever (12) to "Raise" and "Lower" side and check that the boom follows the lever operation.



6.14 ELECTRIC MOTOR INSPECTION

6.14.3.1 PRE-START VISIBLE CHECKS

⚠ WARNING

For more information on checking before starting engine (visible checks), see

“6.12.1.1 PRE-START VISIBLE CHECKS.”

As to the machine abiding by engine and electric motor specifications, potential fire in the machine may occur if a heap of flammable materials and oil leak are present around the hot sections such as the Inverter unit, power supply box, and power unit.

Carefully check around these areas. Should you find any abnormality, be sure to fix it or contact us or our sales service agency.

6.14.3.2 CHECKING BEFORE STARTING ELECTRIC MOTOR

IMPORTANT

For more information on inspections

before starting the electric motor, see

“6.12.1.2 PRE-START INSPECTION - BEFORE STARTING ENGINE.” Perform the tasks other than those related to the engine.

6.14.3.3 CHECKING AFTER STARTING ELECTRIC MOTOR

IMPORTANT

For more information on checking after starting electric motor, see **“6.12.1.3 POST-START INSPECTION - AFTER STARTING ENGINE.”**

6.15 850kg SEARCHER HOOK INSPECTION AND MAINTENANCE

6.15.1 PRE-START-VISIBLE CHECKS

1. Check that there are no abnormalities with the safety equipment.
2. Check that there are no abnormalities with the hooks or other lifting equipment.
3. Check that there is no cracking or deformation on the booms or other structural parts.
4. Check that the specified mounting bolts and nuts are used and that they are not loose or missing.
5. Operate the boom and check that it moves and stops correctly.

Contact our sales service agency if abnormalities are discovered during inspection.

6.15.2 PRE-START-BEFORE STARTING ENGINE

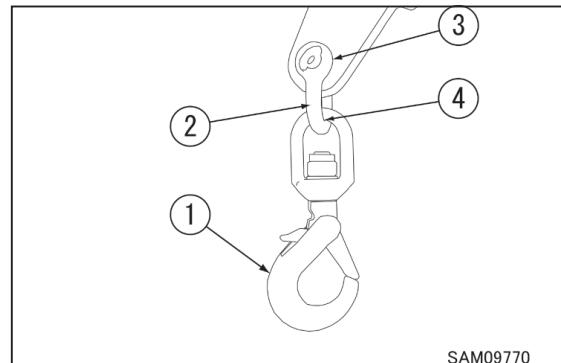
Check the following in this section without starting the engine and before starting work every day.

[1] E-BOOM, FRAME AND HOOK

Check each part of the E-Boom, frame and Hook for cracks, excessive deformation and contamination etc. In addition, check bolts nuts and pins for any looseness, drop and damage etc. If you find any abnormality, repair.

[2] GREASING

Wipe off and clean old grease from contact point (3) of shackle (2) and E-boom hole, and contact point (4) of hook (1) and shackle (2), then apply new lithium grease.



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[3] SEARCHER HOOK FIX BOLTS

⚠ DANGER

If any damage is found on searcher hook fixing bolts, please exchange for new one's right away.

Breakage of bolts will cause the searcher hook to fall off.

Check if bolts used are the designated type. Also check if there are cracks, damage, squashing, heavy dirt, or rust on bolt.

If any abnormality is found, change the bolt for a new one even it is earlier than expected bolt life.

[4] POSITION PIN AND LYNCH PIN

Check if position pin is surely secured with lynch pin.

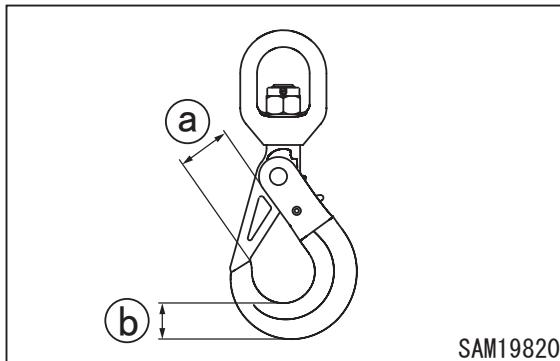
Inspect the pins for damage or excessive deformation. Replace if abnormal.

[5] HOOK

1. Check if the stopper properly works to keep wire rope. If any abnormality is found, replace.
2. Check if the stopper properly works to keep wire rope. If any abnormality is found, replace.

3. Check the hook for any cracks or heavy deformation. If any abnormality is found, replace.
4. Replace when the hook dimensions meet the following replacement standards.

	Standard	Replacement level
a	37mm	More than 38.9mm
b	25mm	Less than 23.7mm



3. Check the monitor display. Verify that no error code is displayed on the Home Screen. Verify that the actual searcher hook position matches the position displayed on the monitor. For more information on the actual position and position switching, see "4.1.7.3 850kg SEARCHER HOOK POSITION SETTINGS."
4. Start the engine and operate the crane as follows to verify if the moment limiter properly displays the value.

6.15.3 POST-START-AFTER STARTING ENGINE

⚠ CAUTION

The checkups described in this section should be carried out after starting the machine.

See "5.2.2 STARTING ENGINE" and later to execute the engine startup, travelling operations, outrigger operations and crane operations.

[1] MOMENT LIMITER FOR OPERATION (SEARCHER HOOK MODE)

⚠ WARNING

If you find any abnormality with the moment limiter, immediately contact us or our sales service agency.

1. Turn the starter switch to the "ON" position.
2. Check with the working status lamp. Green lights up after all three colours have lit up.

Crane Operation and Displayed Parameter	Value Displayed on Moment Limiter
Displayed “boom length” with the boom length at minimum	4.7 m
Displayed “boom length” with the boom length at maximum	16.5 m
Displayed “working radius” with the boom length of “7.7 m” and boom angle of “25°”	SH1 7.3 ± 0.1 m
	SH2 7.6 ± 0.1 m
	SH3 7.2 ± 0.1 m

This checking operation must be operated slowly, and if machine does not auto-stop by overloading, immediately stop the operation, and perform recovery operation caused by overloading.

- ☞ When measuring actual working radius, measure from hook offset position of searcher hook.

5. Check if displayed actual load value is equal to the total weight of the load + the hoisting accessory, when the weight of the known load is hoisted. There may be slight error in accuracy depending on boom condition.
6. Operate the crane until the moment limiter display indicates the boom length is “7.7 m” and boom angle is “25 degrees”, then measure the “boom angle” and “working radius”.
If the measured value(s) differ from the moment limiter display value, contact us or our sales service agency.
7. Lift up load and check if boom extending or boom lowering operation is auto-stopped when overloaded. If the operation is not auto-stopped in overloaded condition, stop using the machine and contact us or our sales service agency.

6.16 1.5t SERCHER HOOK INSPECTION AND MAINTENANCE

6.16.1 PRE-START-VISIBLE CHECKS

1. Check that there are no abnormalities with the safety equipment.
2. Check that there are no abnormalities with the hooks or other lifting equipment.
3. Check that there is no cracking or deformation on the booms or other structural parts.
4. Check that the specified mounting bolts and nuts are used and that they are not loose or missing.
5. Operate the boom and check that it moves and stops correctly.

Contact our sales service agency if abnormalities are discovered during inspection.

6.16.2 PRE-START-BEFORE STARTING ENGINE

Check the following in this section without starting the engine and before starting work every day.

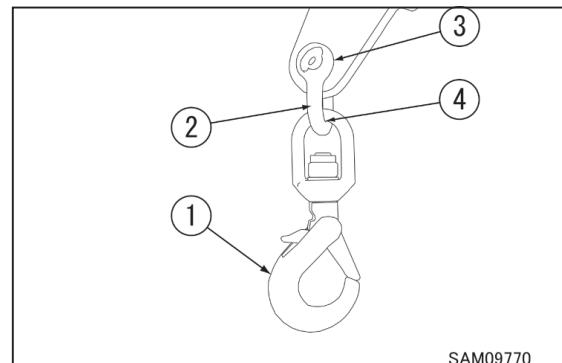
[1] E-BOOM AND BRACKET

Check each part of the E-Boom and bracket for cracks, excessive deformation and contamination etc. If you find any abnormality, repair.

[2] GREASING

Wipe off and clean old grease from contact point as listed below, then apply new lithium grease.

1	Contact point hole (3) of E-boom and shackle (2)
2	Contact point (4) of swivel hook (1) and shackle (2)



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[3] SEARCHER HOOK FIX BOLTS

⚠ DANGER

If any damage is found on searcher hook component, please repair or exchange for new one's right away.

Breakage of the component will cause the searcher hook to fall off.

Check if bolts used are at the designated strength. Also check if the bolts are tightened by designated torque. Refer "Installation of 1.5t Searcher hook" for the designated torque. Also check if there are cracks, damage, squashing, heavy dirt, or rust on bolt. If any abnormality is found, change the bolt for a new one even it is earlier than expected bolt life.

[4] POSITION PIN AND LYNCH PIN

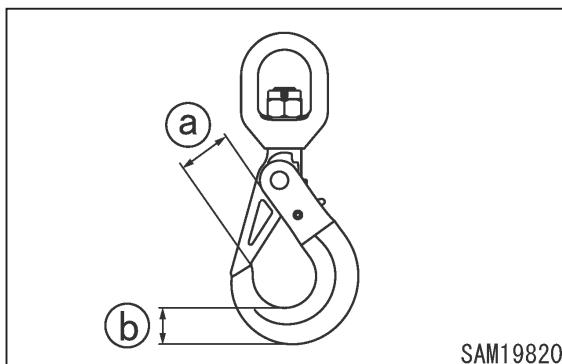
Check if position pin is surely secured with lynch pin.

Check if there are damage or heavy deformation on the pins. If any abnormality is found, change the pins.

[5] SWIVEL HOOK

1. Check if the stopper properly works to keep wire rope. If any abnormality is found, replace.
2. Rotate hook and check if the hook smoothly rotates, and no abnormal noise is heard. If any abnormality is found, repair or replace.
3. Check the hook for any cracks or heavy deformation. If any abnormality is found, replace.
4. Replace when the hook dimensions meet the following replacement standards.

	Standard	Replacement level
a	37mm	More than 38.9mm
b	25mm	Less than 23.7mm

**6.16.3 POST-START-AFTER STARTING ENGINE****⚠ CAUTION**

The checkups described in this section should be carried out after starting the machine.

See “5.2.2 STARTING ENGINE” and later to execute the engine startup, travelling operations, outrigger operations and crane operations.

[1] BOOM OPERATIONS**⚠ WARNING**

When checking the operation of the boom, make safety checks to ensure that the hook and the boom do not come in contact with people or objects.

- Check the boom and searcher hook make no abnormal sounds when operating the crane.
- Operate the crane with no load and check that all the bolts are securely tightened and have not fallen out.

[2] MOMENT LIMITER (1.5T SEARCHER HOOK MODE)**⚠ WARNING**

When an abnormality occurs in the moment limiter, immediately stop using the machine and contact us or our sales service agent.

1. Turn the starter switch to the “ON” position.
2. Check with the working status lamp. Green lights up after all three colours have lit up.
3. Check the monitor display.
Verify that no error code is displayed on the Home Screen.
Verify that the actual searcher hook position matches the position displayed on the monitor.
For more information on the actual position and position switching, see “4.1.7.4 1.5t SEARCHER HOOK POSITION SETTINGS.”
4. Operate the crane and, with the moment limiter displaying boom length “7.7 m” and the boom angle “25 degrees”, make actual measurements of the “Boom angle” and the “Working radius”. Confirm the

difference between the actual measurement and display value of the moment limiter are “within $\pm 0.1\text{m}$ ” and “within $\pm 1^\circ$ ” respectively, contact us or our sales service agency.

- Start the engine and operate the crane to the state as follows. Then, check if the monitor display of the moment limiter is correct.

Crane Operation and Displayed Parameter	Value Displayed on Moment Limiter
Displayed “boom length” with the boom length at minimum	4.7 m
Displayed “boom length” with the boom length at maximum	16.5 m
Displayed “working radius” with the boom length of “7.7 m” and boom angle of “25°”	SH1 $7.1 \pm 0.1\text{ m}$ SH2 $7.2 \pm 0.1\text{ m}$ SH3 $7.1 \pm 0.1\text{ m}$

- Check if displayed actual load value is equal to the total weight of the load + searcher hook + the hoisting accessory, when the load weight is known. There may be slight error in accuracy depending on boom condition.
- Lift up load slowly and check if boom extending or boom lowering operation is auto-stopped when overloaded. If the operation is not auto-stopped in overloaded condition, immediately stop the operation and escape from the overload condition by operating to safe side.
 - To measure the actual working radius, measure it from the hook position by suspending a cord vertically from the hook at the tip of the searcher hook.

6.17 FLY-JIB

6.17.1 INSPECTION AND MAINTENANCE

IMPORTANT

In this section, the devices indicated are exclusive to a Fly-jib model but different from those of a standard model. For devices other than these, refer to the section: “Chapter 6 INSPECTION AND MAINTENANCE.”

6.17.1.1 CHECKING BEFORE OPERATION

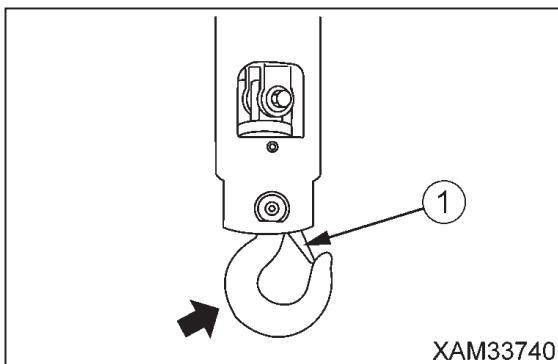
Check the followings in this section before first starting work every day after installing fly-jib.

[1] CHECKING AROUND FLY-JIB

- Check each part of the fly-jib for cracks, excessive deformation, and contamination etc. In addition, check bolts, nuts and pins for any looseness, drop, and damage etc. Be especially careful to check for excessive abrasion and damage of the position pins. If you find any abnormality, repair.
- Check for excessive damage and deformity of the over hoist weight wire rope of the overwinding alarm device at the tip of the fly-jib. If there is any abnormality, repair.
- Check for excessive damage and deformity of the cord real on the left side surface of the fly-jib. If there is any abnormality, repair.
- Check for sagged electrical wire, loose connections and trace of burns. If you find any abnormality, repair.

[2] CHECKING HOOK BLOCK

- Verify that the wire rope latch (1) functions normally. If there is any abnormality, repair.



- Rotate the hook and verify that the hook rotates smoothly and that the trunnion does not emit any abnormal sound.
- Check the hook for any cracks or excessive deformation.
- If there is any abnormality, repair.

6.18 REGULAR MAINTENANCE**6.18.1 INITIAL 10 HOUR MAINTENANCE**

The following maintenance should be performed after 10-hour operation, limited to the first maintenance of a new machine.

[1] GREASING MACHINE UNITS

See "6.18.4 [1] GREASING MACHINE UNITS."

6.18.2 INITIAL 50 HOUR MAINTENANCE

The following maintenance should be performed after 50-hour operation, limited to the first maintenance of a new machine.

[1] REPLACEMENT ENGINE OIL AND OIL FILTER

See "6.18.8 [1] REPLACE ENGINE OIL AND OIL FILTER."

[2] OIL REPLACEMENT IN HYDRAULIC OIL TANK

See "6.18.9 [1] REPLACE OIL IN HYDRAULIC OIL TANK."

[3] REPLACEMENT HYDRAULIC OIL RETURN FILTER

See "6.18.8 [3] REPLACE HYDRAULIC OIL RETURN FILTER."

[4] REPLACEMENT HYDRAULIC OIL SUCTION FILTER

See "6.18.8 [4] REPLACE HYDRAULIC OIL SUCTION FILTER."

[5] CHECKING / ADJUSTMENT ALTERNATOR BELT TENSION

See "[2] CHECK / ADJUST BELT TENSION" 6-62 "6.18.7 [2] CHECK / ADJUST BELT TENSION."

6.18.3 INITIAL 250 HOUR MAINTENANCE

The following maintenance should be performed after 250-hour operation, limited to the first maintenance of a new machine.

[1] OIL REPLACEMENT SLEWING REDUCTION GEAR CASE

See "6.18.9 [2] REPLACE OIL IN SLEWING REDUCTION GEAR CASE."

[2] OIL REPLACEMENT WINCH MOTOR REDUCTION GEAR CASE

See "6.18.9 [3] REPLACE OIL IN WINCH REDUCTION GEAR CASE."

[3] OIL REPLACEMENT TRAVELLING MOTOR REDUCTION GEAR CASE

See "6.18.9 [4] REPLACE OIL IN TRAVELLING MOTOR REDUCTION GEARCASE."

6.18.4 MAINTENANCE EVERY 50 HOURS

[1] GREASE MACHINE UNITS

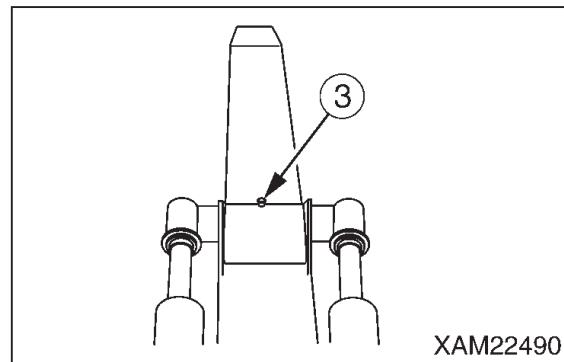
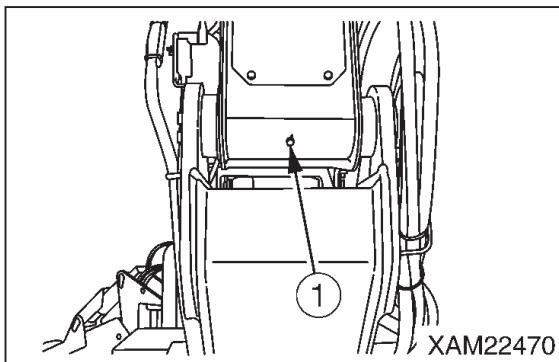
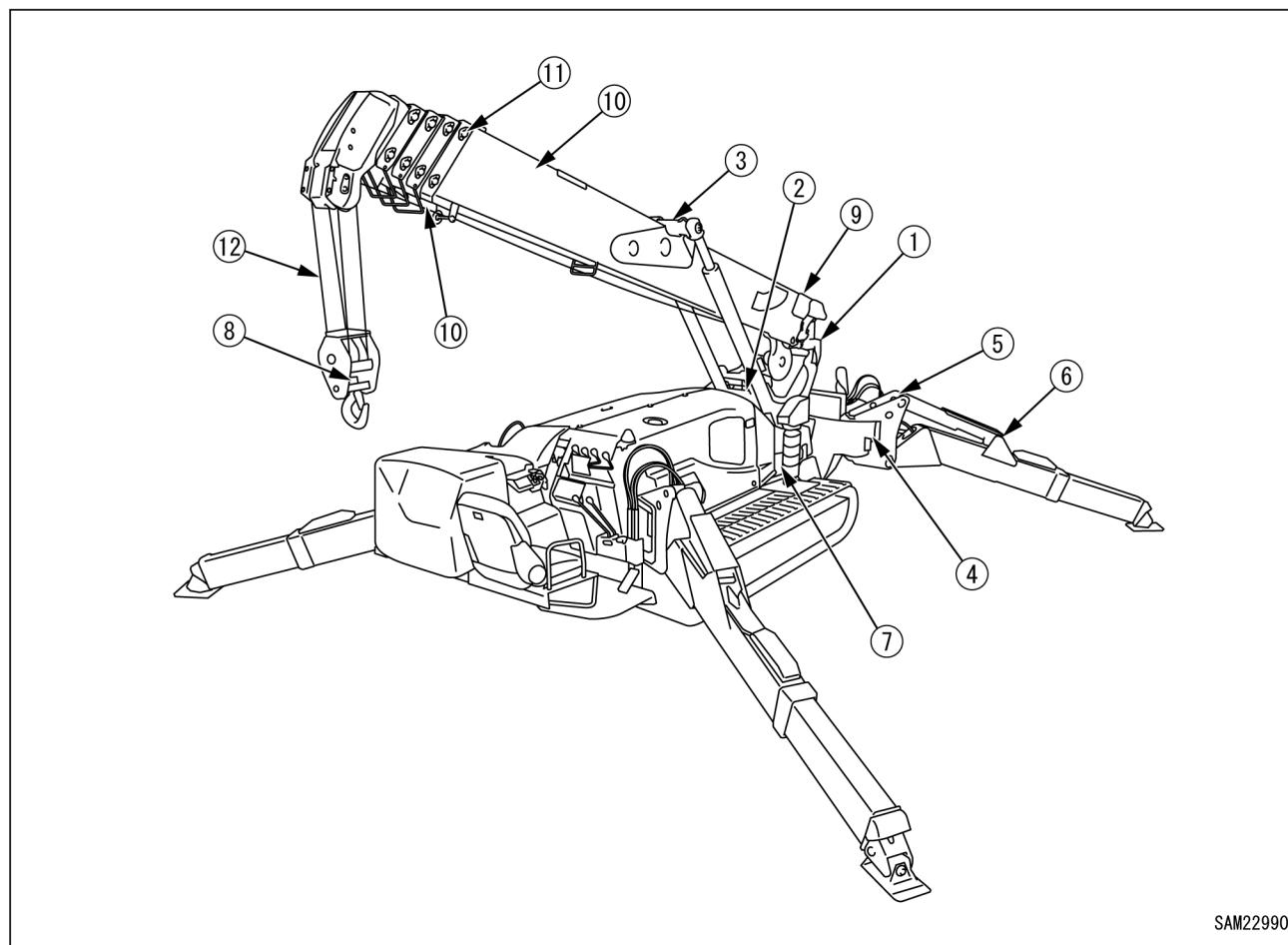
⚠ CAUTION

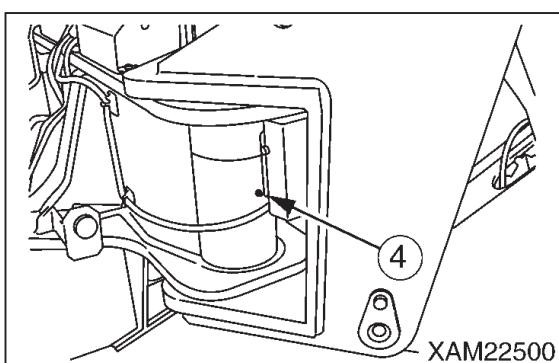
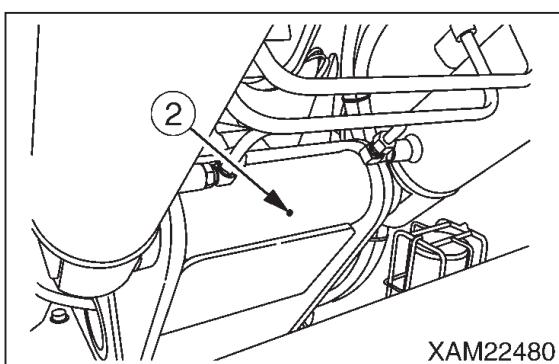
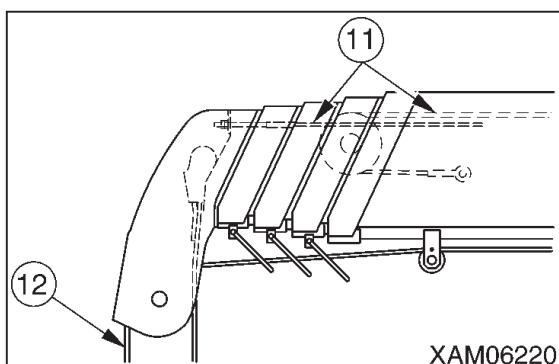
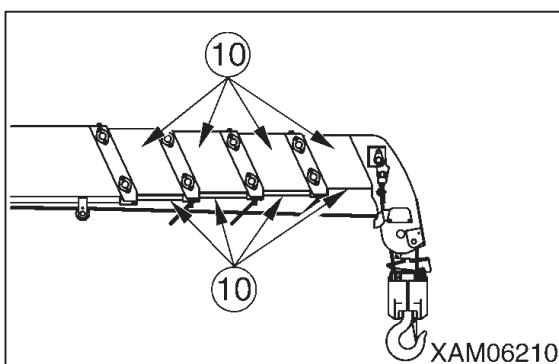
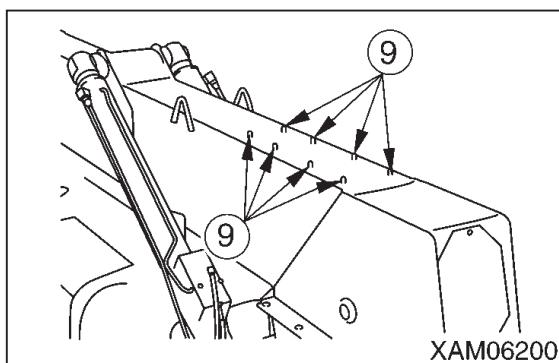
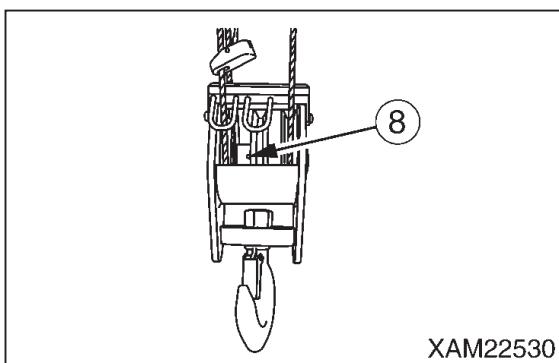
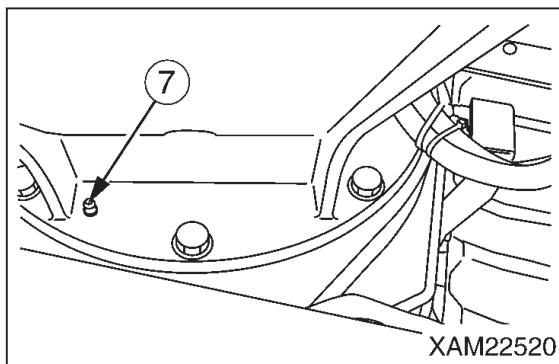
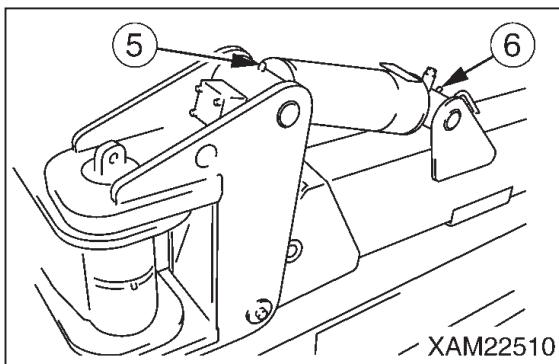
- Grease type varies with greasing points. Failure to grease properly may cause the machine to shorten its useful life. See the following table for grease types.
- Greasing a new machine is required once every 10 hours until the machine attains the first 100 hours of operation that initial fit emerges.

- Use proper grease specified below according to the greasing points.

No	Greasing point	Grease type
1	Greasing of the boom mounting pin	Lithium grease
2	Greasing of the derrick cylinder bottom mounting pin	
3	Greasing of the derrick cylinder rod mounting pin	
4	Greasing of the outrigger rotary shaft	
5	Greasing of the mounting pin of the outrigger grounding cylinder bottom	
6	Greasing of the mounting pin of the outrigger grounding cylinder rod	
7	Greasing of the slewing gear	
8	Greasing of the hook block	
9	Greasing of the boom slide plate	
10	Greasing of both sides and bottom of a boom	Neo grease (grease for boom)
11	Greasing of the boom telescoping wire rope	
12	Greasing of the winch wire rope	

- With the use of the grease gun, grease the greasing points (No.1 to 9) specified in the above table through corresponding grease plugs. (See the following page)
- Wipe off old grease squeezed out after greasing.
- Place the outriggers when greasing the outrigger cylinders.
- Place the boom derrick lever in the "Raise" position (pull it toward you) to raise the boom slightly for greasing the derrick cylinder mounting pin and slide plate that is located on top of the boom.
- Place the boom telescoping lever in the "Extend" position (push it toward the front) to extend the boom for greasing both sides and bottom of the boom and wire rope.
- Apply red rope grease to prevent wire rope abrasion and rust formation. With the rope surface cleaned, grease the rope with a brush.





6.18.5 FLY-JIB MAINTENANCE EVERY 50 HOURS

[1] GREASING MACHINE UNITS

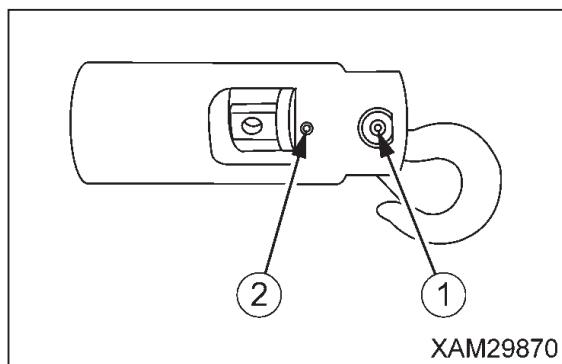
IMPORTANT

- Greasing a new machine is required once every 10 hours until the machine attains the first 100 hours of operation. After that period grease as required.
- Any unusual noise at greasing points requires immediate greasing regardless of the maintenance period.

Use a grease type in the following table depending on the greasing point.

No.	Greasing point	Grease type
1	Hook block greasing	2 Places
2		Lithium grease

1. Grease, by using a grease pump, to the grease fitting indicated with an arrow.



2. Cleanly wipe off the old grease that was pushed out after greasing.

6.18.6 MAINTENANCE EVERY 100 HOURS

Perform this maintenance in tandem with maintenance every 50 hours.

[1] CHECK OIL LEVEL AND REFILL OIL IN WINCH REDUCTION GEAR CASE

⚠ WARNING

- Oil will be at elevated temperatures immediately after engine operation, which urges you not to unplug the inspection port. Unplug the port with the oil cold.
- Always perform inspection and replenishment of oil with the engine stopped.

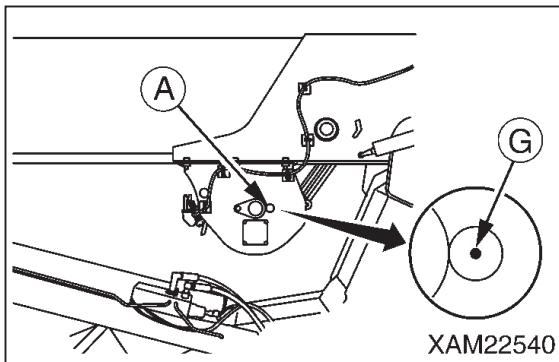
⚠ CAUTION

- For more information on the which oil to be used, see “6.6.1 USE OF FUEL AND LUBRICATING OIL ACCORDING TO TEMPERATURES.”
- Use seal tape, etc. at the thread of the filler plug to stop the oil leak and securely tighten the plug after refilling with the oil.

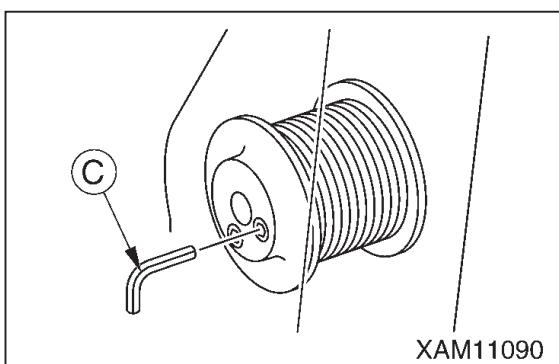
• Hexagonal wrench for plug removal: 8mm

1. Place the machine on a level surface.
2. See “5.2.13 OUTRIGGER SETTING” to rotate the rotary of the “outrigger [4]” outward.

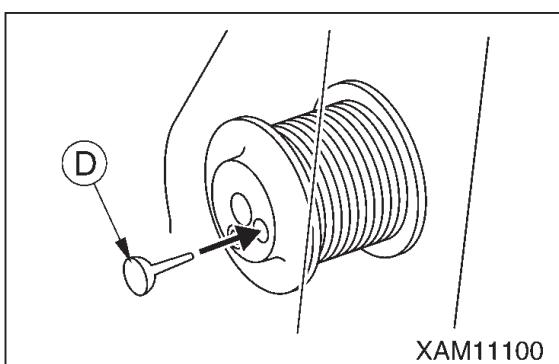
3. Rotate the winch slowly until the oil inspection plug (G) reaches a point where it can be seen through the post side inspection hole (A).



4. Use the hexagonal wrench (C) to loosen the oil inspection plug (G). Check if the gear oil exudes from the oil inspection plug (G).



5. If check finds no exudation of the gear oil, rotate the oil inspection plug (G) slowly to remove it. Replenish gear oil with the use of an oil pump (D).



☞ Wipe off the oil completely if spilled.

6. Put in the oil inspection plug (G) and secure it upon completion of oil replenishment.

7. See "5.2.24 OUTRIGGER STOWING OPERATION" to stow the outriggers.

6.18.7 MAINTENANCE EVERY 250 HOURS

Perform this maintenance in tandem with maintenance every 50/100 hours.

[1] RADIATOR AND OIL COOLER FIN INSPECTION/CLEANING

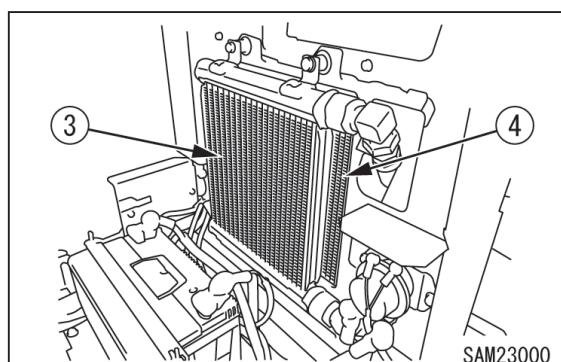
⚠ WARNING

Note dust and debris hazards when using compressed air. Always wear protective goggles and a mask.

⚠ CAUTION

- To avoid damaging the fins when cleaning with compressed air, use compressed air at a pressure of approximately 0.20 to 0.29 MPa (2 to 3 kg/cm²) and blow from a safe distance from the fins. Damage to the fins may result in water leaks and overheating.
- In dusty locations, inspect the fins daily and clean when necessary.

1. Position the machine on a level surface.
2. Remove the machinery cover as described in "4.2 REMOTE CONTROL SYSTEM."
3. Apply compressed air (0.20 to 0.29 MPa (2 to 3 kg/cm²) to the oil cooler (3) and radiator (4) to dislodge any dirt or debris clogging the fins.

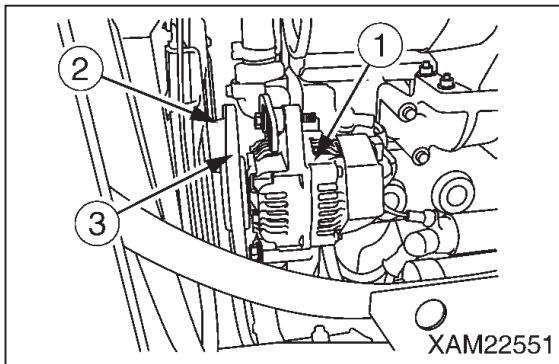


- After cleaning, reattach the machinery cover as described in "4.2 REMOTE CONTROL SYSTEM."

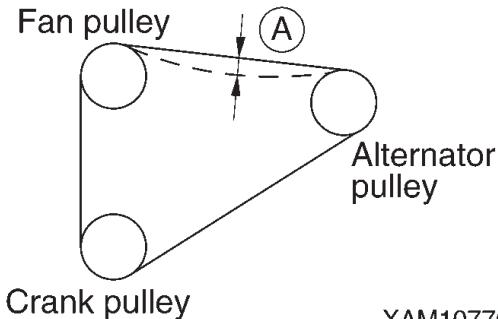
[2] CHECK / ADJUST BELT TENSION

[TENSION CHECK]

- Remove the machinery cover as described in "4.2 REMOTE CONTROL SYSTEM."
- With the fingers, push (by approximately 98 N {10kgf}) the midpoint between the fan pulley (2) and alternator pulley (1) of the belt (3), and if the strain is between 10 and 12 mm it is within standard.



- If the inspection result indicated that the strain of the belt (3) is out of the standard value range, see the Tension check section and adjust the tension of the belt (3).



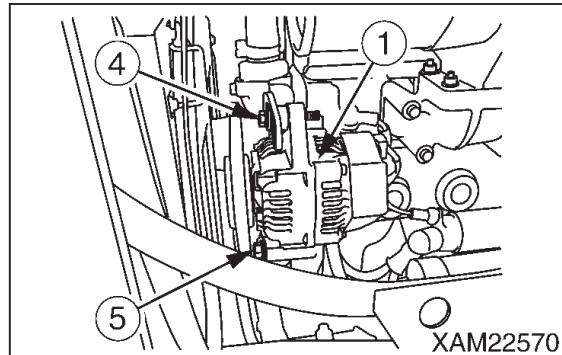
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- Inspect the followings as well when you inspect the tension of the fan belt.
 - Check the pulleys for breakage, the V groove and belt for wear. Ensure that the belt is not in contact with the bottom of the V groove.
 - Prompt belt replacement is required if belt adjustment is no longer enabled due to a stretched belt or if the belt is scratched or cracked.
 - At least 5 minute long test run is required after belt replacement. Re-adjust the belt tension upon completion of test run.

[TENSION ADJUSTMENT]

- Have a wooden bar available.

- Insert the bar between the alternator (1) and cylinder block.



- Loosen the lower bolt (5) and adjusting bolt (4).

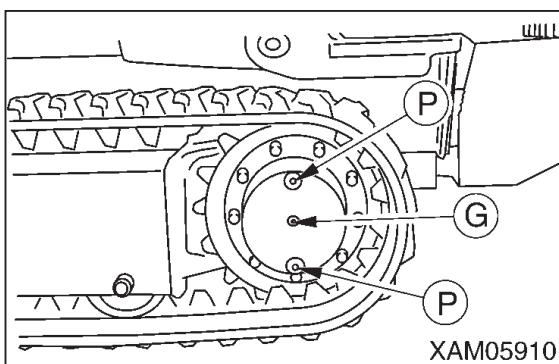
3. Move the alternator (1) until strain of the belt (3) falls within the standard value range, pulling the bar toward you.
4. Tighten the alternator lower bolt (5) and then the adjusting bolt (4) to secure the alternator (1).
5. Reattach the machinery cover as described in "4.2 REMOTE CONTROL SYSTEM."

[3] CHECK / REFILL OIL IN TRAVELLING MOTOR REDUCTION GEAR CASE

⚠ CAUTION

- For more information on the which oil to be used, see "6.6.1 USE OF FUEL AND LUBRICATING OIL ACCORDING TO TEMPERATURES."
- Use seal tape, etc. at the thread of the filler plug to stop the oil leak and securely tighten the plug after refilling with the oil.

1. Move the machine forward and backward to position it immediately above the drain plug (P) of the travelling motor reduction gear case.



- ☞ This machine is equipped with two drain plugs (P). Either drain plug must be positioned directly underneath the machine.

2. Remove the oil inspection plug (G) of the travelling motor reduction gear case, and make sure oil is drained from the plug hole.
3. In the case of insufficient oil in the casing, remove the top drain plug (P) and replenish gear oil through the plug hole.
 - ☞ Replenish the gear oil until it exudes from the oil inspection plug.
 - ☞ Wipe off the oil completely if spilled.
4. Put in the top drain plug (P) and oil inspection plug (G), and secure the plugs upon completion of oil inspection and replenishment.

6.18.8 MAINTENANCE EVERY 500 HOURS

Perform this maintenance in tandem with maintenance every 50/100/250 hours.

[1] REPLACE ENGINE OIL AND OIL FILTER

⚠ WARNING

- The drain plug of the engine oil pan is located directly underneath the machine. Place the outriggers and raise the machine 50mm from the ground for draining engine oil. Insert square timbers between both rubber track and the ground to gain stability for safety assurance.
- Make sure the oil level gauge is secured properly after inspection and replenishment of the oil. Potential fall of the oil level gauge during operation may occur if disregarded, which could cause boiling oil to gush that results in burns.

- All the parts will be at elevated temperatures immediately after engine operation, which urges you not to replace oil and the filter cartridge. Always perform replacement with the engine cold to touch.

⚠ CAUTION

- Ensure that no old gasket adheres to the filter stand. Potential oil leak may occur if old gasket remains on the stand.
- Be sure to use oil specified in “6.6.1 USE OF FUEL AND LUBRICATING OIL ACCORDING TO TEMPERATURES.” Failure to use proper oil may cause the engine to shorten its useful life. Always use the specified oil for replenishment.
- The engine oil must be maintained at a proper amount.
- The complete draining of oil is disabled if the engine becomes cold completely. Oil draining is allowed when the engine is cold to touch.
- Keep impurities out of the filler cap when replenishing oil.

- Oil drain pan: An 8-litre container
- Quantity of oil for replacement: 6.7L

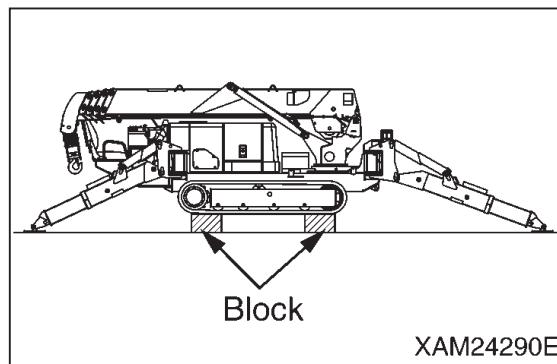
1. Place the machine on a level surface.
2. See “5.2.13 OUTRIGGER SETTING” to set the outriggers and raise the rubber track for about 50mm from the ground.

⚠ WARNING

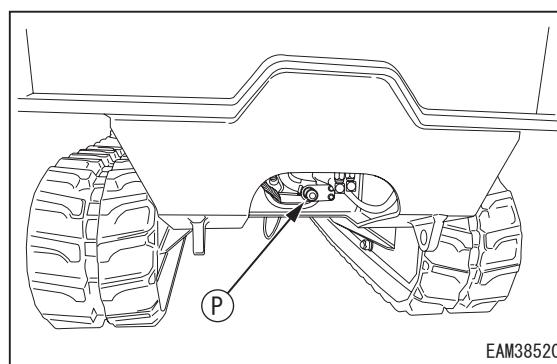
Check the following before crawling under the machine:

- Ensure that the outriggers are extended at the maximum.
- Visually check the level to make sure the machine in a horizontal position.

- Insert solid blocks between the crawler and the ground to keep the machine raised.

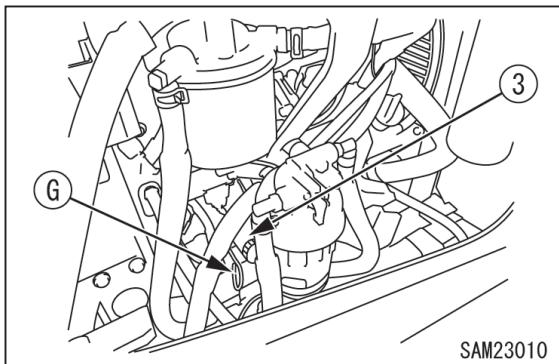


3. Crawl under the machine and place a drain pan directly underneath the drain plug (P) at the bottom of the engine oil pan to receive drained oil.



4. Remove the drain plug (P) slowly to drain the oil, keeping from contact with draining oil.
5. Check the drained oil. If check finds a considerable amount of metal powder and foreign objects, contact our sales service agency.
6. Put in the drain plug (P) and secure it.
7. See “5.2.24 OUTRIGGER STOWING OPERATION” to stow the outriggers and lower the machine on the ground.
8. Remove the machinery cover as described in “4.2 REMOTE CONTROL SYSTEM.”

9. Turn the filter cartridge (3) counterclockwise (left) with the use of the filter wrench to remove it.



- ☞ The oil is to be drained in large quantity immediately after the engine is stopped. Wait for 10 minutes before removing the filter cartridge (3).

10. Clean the filter stand. Apply clean engine oil (or a light coating of grease) to a new filter cartridge gasket and thread part, and install the filter cartridge.

- ☞ With the gasket surface maintained contact with the sealing surface of the filter stand, rotate the filter cartridge one-half to three-quarters of a turn to secure it.
- ☞ Always give manual tightening to the filter cartridge.

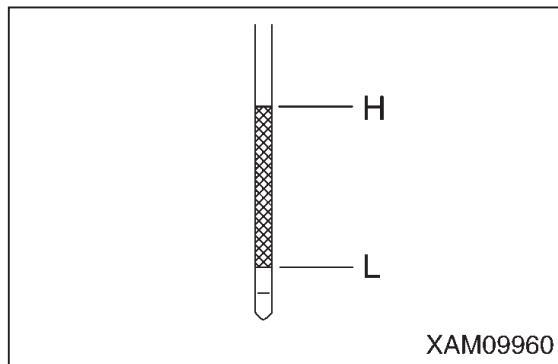
11. Check around the filter cartridge (3) for oil leaks. Be sure to wipe off oil completely if spilled.

12. After replacing the filter cartridge (3), supply the engine oil at a specified amount from the filler cap (F).

13. With the oil level gauge (G) pulled out, wipe off the oil with a waste cloth.

14. With the oil level gauge (G) inserted in the gauge guide, pull the oil level gauge out.

15. Make sure the oil level is in the range "H" to "L" marked on the oil level gauge (G).



16. Attach the oil level gauge (G) and filler cap (F) properly upon completion of oil replacement.

17. Start the engine, and idle it for 5 minutes. Stop the engine.

18. Make sure again the oil level is in the range "H" to "L" marked on the oil level gauge (G).

19. Reattach the machinery cover as described in "4.2 REMOTE CONTROL SYSTEM."

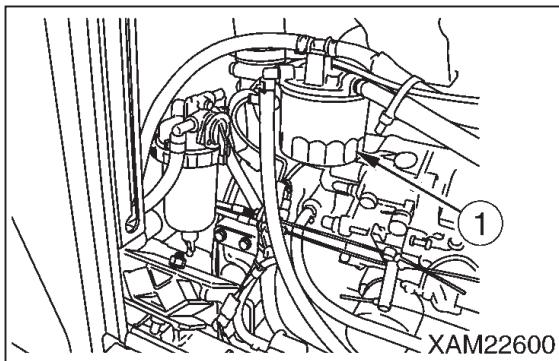
[2] REPLACE FUEL FILTER CARTRIDGE

⚠ WARNING

- Keep from heat and flame, including cigarettes, when replacing the fuel filter element.
- All the parts will be at elevated temperatures immediately after engine operation, which urges you not to replace the fuel filter element. Always perform replacement with the engine cold to touch.

1. Place the machine on a level surface.
2. Open the access hatch in the right-hand machinery cover.

- Turn the filter cartridge (1) counterclockwise (left) with the use of the filter wrench to remove it.



- Clean the filter stand. Apply clean engine oil (or a light coating of grease) to a new filter cartridge gasket and thread part, and attach the filter cartridge.
 - With the gasket surface maintained contact with the sealing surface of the filter stand, rotate the filter cartridge one-half to three-quarters of a turn to secure it.
 - Always give manual tightening to the filter cartridge.
- Check around the filter cartridge (1) for fuel leaks. Be sure to wipe off fuel completely if spilled.
- Close the access hatch.

[3] REPLACE HYDRAULIC OIL RETURN FILTER

⚠ WARNING

- All the parts will be at elevated temperatures immediately after engine operation, which urges you not to replace the filter. Always perform replacement with the engine cold.
- Potential gush of oil may occur upon removing the filler cap of the hydraulic oil tank.

Be sure to relieve internal pressure by slowly rotating the filler cap before cap removal.

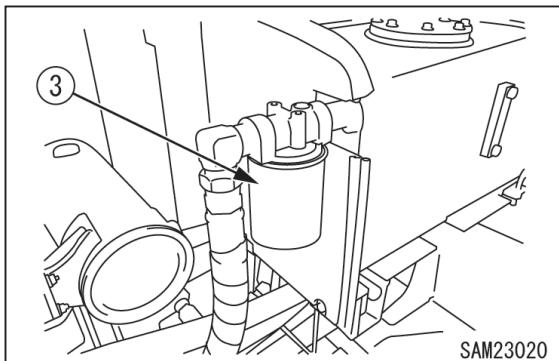
- Make sure the filler cap is closed properly after replenishment of the oil. Potential fall of the filler cap during operation may occur if disregarded, which could cause boiling oil to gush that results in burns.

⚠ CAUTION

- For more information on the which oil to be used, see “6.6.1 USE OF FUEL AND LUBRICATING OIL ACCORDING TO TEMPERATURES.”
- Place the machine in travel position for oil quantity inspection. Oil quantity inspection with the machine in working position may deceive your eyes to deem the quantity of oil low. Owing to improper judgment, the oil may be supplied at an excessive amount.
- The engine must be at halt until piping and hydraulic equipment is filled with oil after replacement of the hydraulic oil filter.
- Oil replenished should remain below “H” (upper limit) on the level gauge. Excessive oil replenishment may cause the oil to gush from the air breather during machine travelling and crane operation, which could result in burns.
- Keep impurities out of the filler cap when replenishing oil.

- Place the machine on a level surface.
- Remove the machinery cover as described in “4.2 REMOTE CONTROL SYSTEM.”

- Turn the filter cartridge (3) counterclockwise (left) with the use of the filter wrench to remove it.



- Clean the filter stand. Apply clean engine oil (or a light coating of grease) to the gasket and thread part of a new filter cartridge (3), and attach the filter cartridge.
 - With the gasket surface maintained contact with the sealing surface of the filter stand, rotate the filter cartridge one-half to three-quarters of a turn to secure it.
 - Always give manual tightening to the filter cartridge.
- Check around the filter cartridge (3) for oil leaks. Be sure to wipe off oil completely if spilled.
- See “6.12.1.2 PRE-START INSPECTION - BEFORE STARTING ENGINE” to check the oil level in the hydraulic oil tank. Prompt oil refilling is required if check finds insufficient oil.
- Install the inspection cover (2), and secure it with the four mounting bolts (1).
- Reattach the machinery cover as described in “4.2 REMOTE CONTROL SYSTEM.”

[4] REPLACE HYDRAULIC OIL SUCTION FILTER

⚠ WARNING

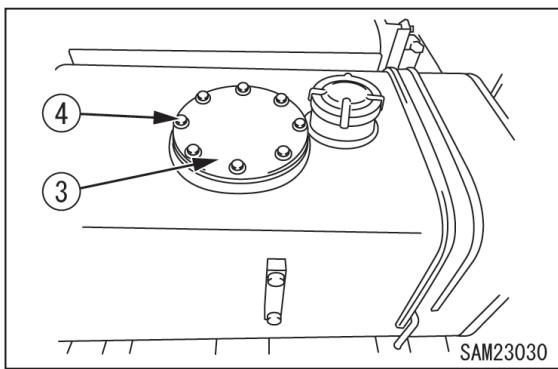
- All the parts will be at elevated temperatures immediately after engine operation, which urges you not to replace the filter. Always perform replacement with the engine cold.
- Potential gush of oil may occur upon removing the filler cap of the hydraulic oil tank. Be sure to relieve internal pressure by slowly rotating the filler cap before cap removal.
- Make sure the filler cap is closed properly after replenishment of the oil. Potential fall of the filler cap during operation may occur if disregarded, which could cause boiling oil to gush that results in burns.

⚠ CAUTION

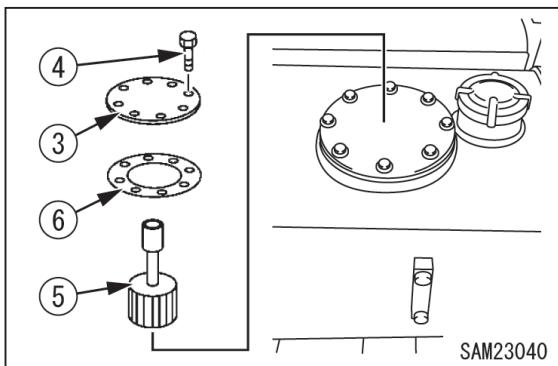
- For more information on the which oil to be used, see “6.6.1 USE OF FUEL AND LUBRICATING OIL ACCORDING TO TEMPERATURES.”
- Place the machine in travel position for oil quantity inspection. Oil quantity inspection with the machine in working position may deceive your eyes to deem the quantity of oil low. Owing to improper judgment, the oil may be supplied at an excessive amount.
- The engine must be at halt until piping and hydraulic equipment is filled with oil after replacement of the hydraulic oil filter.
- Oil replenished should remain below “H” (upper limit) on the level gauge. Excessive oil replenishment may cause the oil to gush from the air breather during machine travelling and crane operation, which could result in burns.

- **Keep impurities out of the filler cap when replenishing oil.**

1. Place the machine on a level surface.
2. Refer to section “5.2.13 OUTRIGGER SETTING” and rotate the outrigger rotary outward.
3. Remove the machinery cover as described in “4.2 REMOTE CONTROL SYSTEM.”
4. Remove the eight mounting bolts (4) and remove the flange (3) on top of the hydraulic oil tank.



5. Remove the flange (3) and pull out the suction filter (5) from inside the hydraulic oil tank.



6. Insert the new suction filter (5) to the inside of the hydraulic oil tank.
7. Put the flange (3) in place with liquid packing applied to the rubber plate (6). Secure the flange (3) with the eight mounting bolts (4).

☞ Wipe off the oil completely if spilled.

8. See “6.12.1.2 PRE-START INSPECTION - BEFORE STARTING ENGINE” to check the oil level in the hydraulic oil tank. Prompt oil refilling is required if check finds insufficient oil.
9. Use the following procedure for air bleed.
 1. Start the engine with piping and hydraulic equipment filled with oil. Make sure the engine runs at low idle for 10 minutes.
 2. Move the cylinders and winch motor slowly with a crane control lever at low idle speed. Always stop the boom derrick cylinder and telescoping cylinder approx. 100mm back from the stroke end when operating the cylinders. Repeat this task 4 to 5 times.
 3. Allow all the outriggers to be extended, referring to “5.2.13 OUTRIGGER SETTING.” Extend and retract the outrigger cylinder, keeping the machine down on the ground. Always stop the outrigger cylinder approx. 100mm back from the stroke end when operating the cylinder. Repeat this task 4 to 5 times.
10. Reattach the machinery cover as described in “4.2 REMOTE CONTROL SYSTEM.”

[5] SLEW RING MOUNTING BOLT INSPECTION

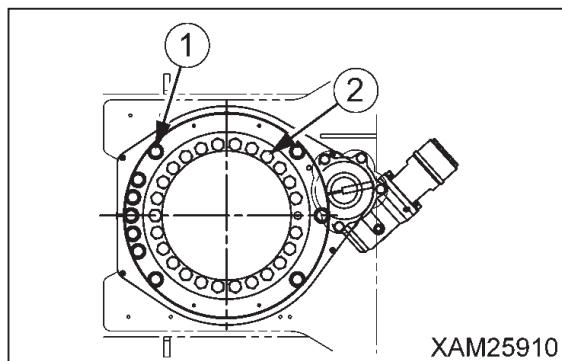
⚠ WARNING

- **If the slew ring mounting bolts become loose and break, there is a risk of serious injuries due to the upper part of the crane becoming detached and toppling. Be sure to inspect the slew ring mounting bolts, and retighten them to the specified torque if they are loose.**

- Be sure to replace the slew ring mounting bolts periodically. The bolts should be replaced every 7 years or after 7,000 hours, whichever comes sooner.

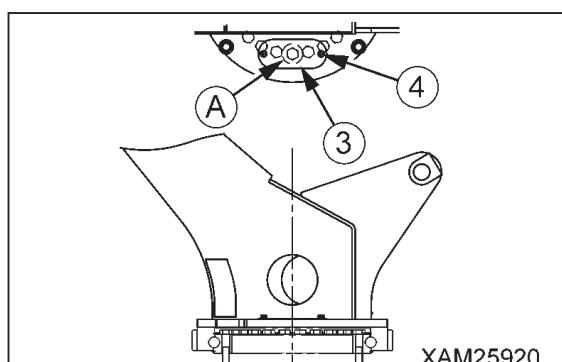
SLEW RING MOUNTING BOLT TIGHTENING TORQUE

No.	Mounting position	Dimensions	Number used	Tightening torque
(1)	Bearing inner ring side	M20	25	363 to 392 Nm
(2)	Bearing outer ring side	M18	10	235 to 265 Nm



Inspect the inner ring mounting bolts (2) as follows.

1. Remove the two mounting bolts (4) and remove the inspection cover (3) to the right of the slew post.



2. Rotate the post to position each bearing inner ring side mounting bolt (2) in the middle of the inspection opening (A), and inspect all of the mounting bolts (2) to confirm that none are loose, missing, or damaged.
3. If any of the bolts are loose, retighten using the tightening torques given in the table above. If bolts are damaged or missing, they should be replaced with new ones.
4. Once inspection is complete, reattach the inspection cover (3).

Inspect the outer ring mounting bolts (1) as follows.

1. Rotate the post to position each bearing outer ring side mounting bolt (1) at the side of the machine, and inspect all of the mounting bolts (1) to confirm that none are loose, missing, or damaged.
2. If any of the bolts are loose, retighten using the tightening torques given in the table above. If bolts are damaged or missing, they should be replaced with new ones.

[6] REPLACE AIR CLEANER ELEMENT

⚠ CAUTION

For more information on replacement procedure, see “6.18.13 [4] INSPECT / CLEAN / REPLACE AIR CLEANER.”

6.18.9 MAINTENANCE EVERY 1000 HOURS

Perform this maintenance in tandem with maintenance every 50/100/250/500 hours.

[1] REPLACE OIL IN HYDRAULIC OIL TANK

⚠ WARNING

- All the parts will be at elevated temperatures immediately after engine operation, which urges you not to replace oil. Always perform replacement with the oil cold.
- Potential gush of oil may occur upon removing the filler cap of the hydraulic oil tank. Be sure to relieve internal pressure by slowly rotating the filler cap before cap removal.
- Make sure the filler cap is closed properly after replenishment of the oil. Potential fall of the filler cap during operation may occur if disregarded, which could cause boiling oil to gush that results in burns.

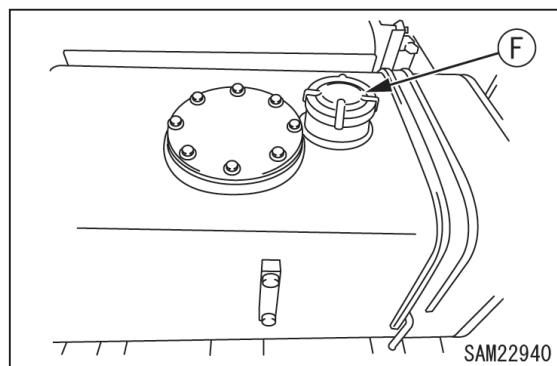
⚠ CAUTION

- For more information on the which oil to be used, see “6.6.1 USE OF FUEL AND LUBRICATING OIL ACCORDING TO TEMPERATURES.”
- Place the machine in travel position for oil quantity inspection. Oil quantity inspection with the machine in working position may deceive your eyes to deem the quantity of oil low. Owing to improper judgment, the oil may be supplied at excessive amount.
- The engine must be at halt until piping and hydraulic equipment is filled with oil after replacement of the hydraulic oil filter.

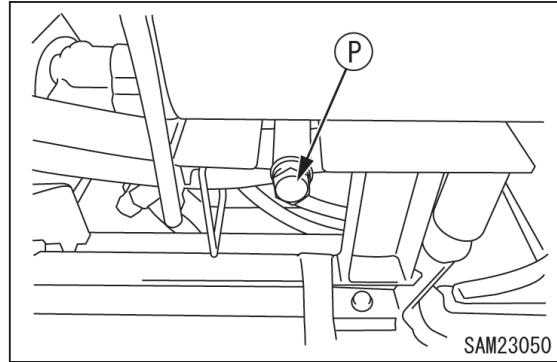
- Oil replenished should remain below “H” (upper limit) on the level gauge. Excessive oil replenishment may cause the oil to gush from the air breather during machine travelling and crane operation, which could result in burns.
- Keep impurities out of the filler cap when replenishing oil.

- Oil drain pan: A 70-litre container
- Quantity of oil for replacement: 55L

1. Place the machine on a level surface.
2. Remove the machinery cover as described in “4.2 REMOTE CONTROL SYSTEM.”
3. Remove the filler cap (F) located on top of the hydraulic oil tank.

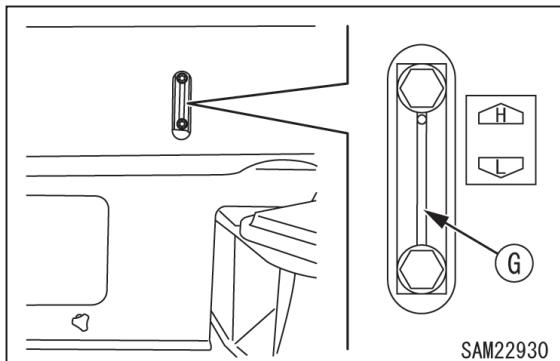


4. Place a drain pan directly underneath the drain plug (P) to receive drained oil.
5. Remove the drain plug (P) slowly to drain the oil, keeping from contact with draining oil.



6. Check the drained oil. If check finds a considerable amount of metal powder and foreign objects, contact our sales service agency

7. Put in the drain plug (P) and secure it.
8. Supply the hydraulic oil to a specified level point from the filler cap (F), visually checking the oil level gauge (G).



9. Close the filler cap (F) after replenishment of the oil.

☞ Wipe off the oil completely if spilled.

10. Use the following procedure for air bleed.

1. Start the engine with piping and hydraulic equipment filled with oil. Make sure the engine runs at low idle for 10 minutes.
2. Move the cylinders and winch motor slowly with a crane control lever at low idle speed. Always stop the boom derrick cylinder and telescoping cylinder approx. 100mm back from the stroke end when operating the cylinders. Repeat this task 4 to 5 times.
3. Allow all the outriggers to be extended, referring to "5.2.13 OUTRIGGER SETTING." Extend and retract the outrigger cylinder, keeping the machine down on the ground. Always stop the outrigger cylinder approx. 100mm back from the stroke end when operating the cylinder. Repeat this task 4 to 5 times.

11. Reattach the machinery cover as described in "4.2 REMOTE CONTROL SYSTEM."

[2] REPLACE OIL IN SLEWING REDUCTION GEAR CASE

⚠ WARNING

The drain plug of the slewing reduction gear case is located directly underneath the machine.

Place the outriggers and raise the machine 50mm from the ground to allow a drain pan to be placed under the machine for draining oil. If the machine becomes unstable and wobbles, insert supports under the front and back of the machine to gain stability.

⚠ CAUTION

- For more information on the which oil to be used, see "6.6.1 USE OF FUEL AND LUBRICATING OIL ACCORDING TO TEMPERATURES."
- Use seal tape, etc. at the thread of the filler plug to stop the oil leak and securely tighten the plug after refilling with the oil.

- Oil drain pan: A 1-litre container
- Quantity of oil for replacement: 0.6L

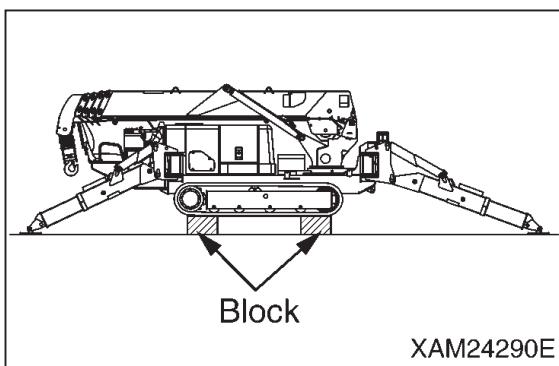
1. Place the machine on a level surface.
2. See "5.2.13 OUTRIGGER SETTING" to set the outriggers and raise the machine from the ground.

⚠ WARNING

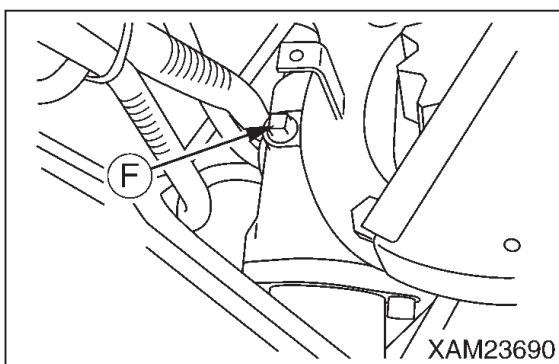
Check the following before crawling under the machine:

- Ensure that the outriggers are extended at the maximum.
- Visually check the level to make sure the machine in a horizontal position.

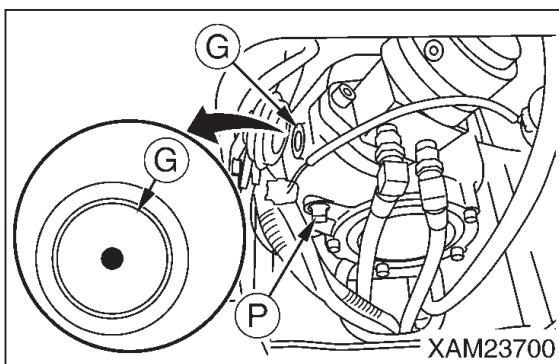
- Insert solid blocks between the crawler and the ground to keep the machine raised.



3. Remove the filler plug (F) from the slewing reduction gear case.



4. Crawl under the machine and place a drain pan directly underneath the drain plug (P) of the slewing reduction gear case to receive drained oil.



5. Remove the drain plug (P) slowly to drain the oil, keeping from contact with draining oil.
6. Check the drained oil. If check finds a considerable amount of metal powder and foreign objects, contact our sales service agency.

7. Put in the drain plug (P) and secure it.
8. Supply the gear oil to the slewing reduction gear case through the filler plug (F).
 - ☞ The gear oil must be filled from the filler cap, up to the midpoint of the site gauge (G).
 - ☞ Wipe off the oil completely if spilled.
9. Put in the filler plug (F) and secure it after oil replacement.
10. See "5.2.24 OUTRIGGER STOWING OPERATION" to stow the outriggers.

[3] REPLACE OIL IN WINCH REDUCTION GEAR CASE

⚠ WARNING

Oil will be at elevated temperatures immediately after engine operation, which urges you not to unplug the inspection port and drain port. Unplug the port with the oil cold.

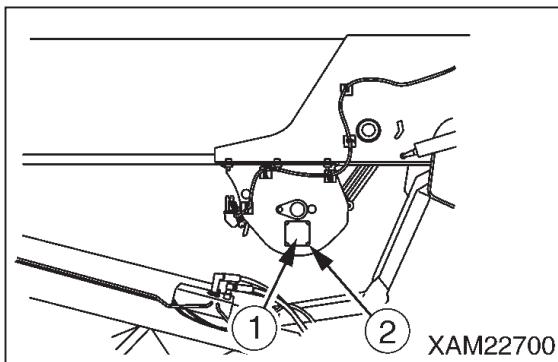
⚠ CAUTION

- For more information on the which oil to be used, see "6.6.1 USE OF FUEL AND LUBRICATING OIL ACCORDING TO TEMPERATURES."
- Use seal tape, etc. at the thread of the filler plug to stop the oil leak and securely tighten the plug after refilling with the oil.

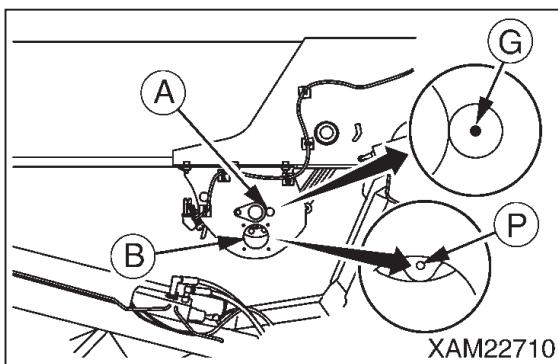
- Oil drain pan: A 1-litre container
- Hexagonal wrench for plug removal: 8mm
- Quantity of oil for replacement: 0.5L

1. Place the machine on a level surface.
2. See "5.2.13 OUTRIGGER SETTING" to set the outriggers.

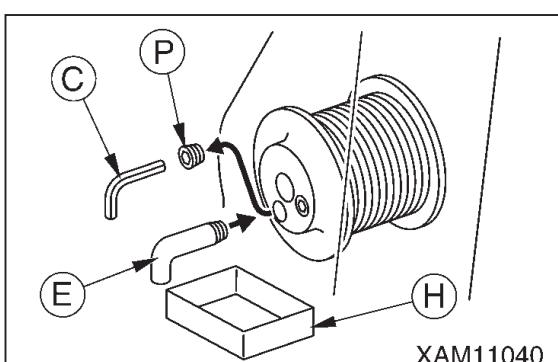
3. Remove the four mounting bolts (2) and remove the cover (1).



4. Rotate the winch slowly to a point where the oil inspection plug (G) and drain plug (P) come in sight.



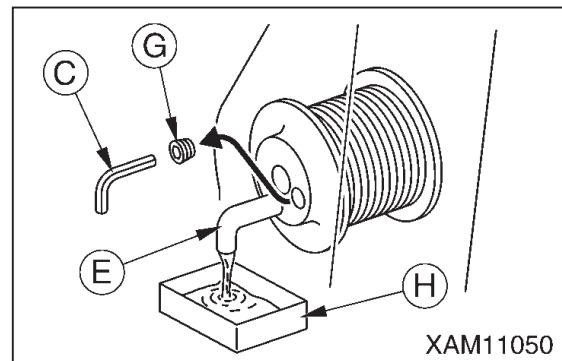
1. Stop the winch at a point where the oil inspection plug (G) can be seen through the post side inspection hole (A).
2. Stop the winch at a point where the drain plug (P) of the winch reduction gear case can be seen above the inspection hole (B).
5. Use the hexagonal wrench (C) to remove the drain plug (P).



6. Install the elbow (E) to the screw hole of the drain plug (P) for draining oil.

7. Place a drain pan (H) directly under the elbow (E) to receive drained oil.

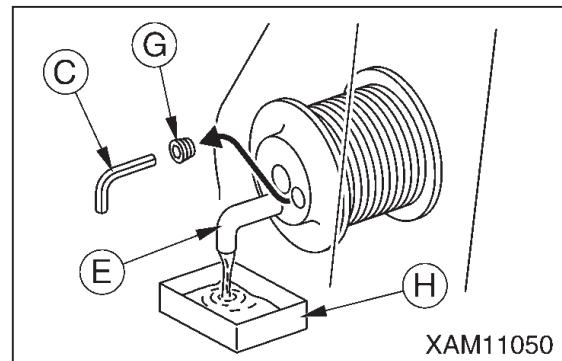
8. Use the hexagonal wrench (C) to remove the oil inspection plug (G). The gear oil is drained from the winch reduction gear case upon plug removal.



9. Remove the elbow (E) after the gear oil is completely drained from the winch reduction gear case. Put in the drain plug (P) and secure it.

10. Install the cover (1), and secure it with the four mounting bolts (2).

11. Pump the gear oil through the oil inspection plug (G) with the use of the oil pump (D).



☞ Pump the gear oil until it exudes from the oil inspection plug.

12. Put in the oil inspection plug (G) and secure it upon completion of oil replenishment.

☞ Perform a proper break-in with no object hoisted for 5 minutes after oil replacement.
☞ Wipe off the oil completely if spilled.

13. See "5.2.24 OUTRIGGER STOWING OPERATION" to stow the outrigger.

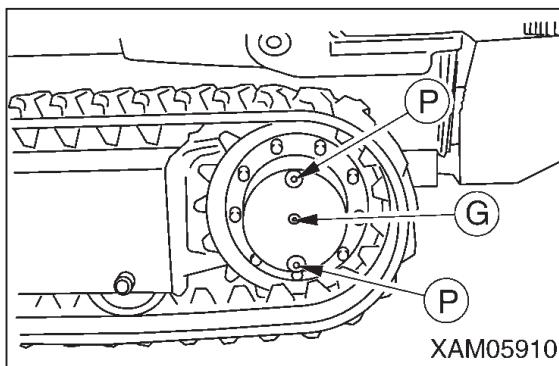
[4] REPLACE OIL IN TRAVELLING MOTOR REDUCTION GEARCASE

⚠ CAUTION

- For more information on the which oil to be used, see "6.6.1 USE OF FUEL AND LUBRICATING OIL ACCORDING TO TEMPERATURES."
- Use seal tape, etc. at the thread of the filler plug to stop the oil leak and securely tighten the plug after refilling with the oil.

- Oil drain pan: A 1-litre container
- Quantity of oil for replacement: 1.0L

1. Place the machine on a level surface.
2. Move the machine forward and backward to position it immediately above the drain plug (P) of the travelling motor reduction gear case.



- ☞ This machine is equipped with two drain plugs (P). Either drain plug must be positioned directly underneath the machine.

3. Place a drain pan directly under the lower drain plug (P) to receive drained oil.
4. Remove the upper drain plug (P) and oil inspection plug (G).
5. Remove the lower drain plug (P) slowly to drain the oil, keeping from contact with draining oil.

6. Check the drained oil. If check finds a considerable amount of metal powder and foreign objects, contact our sales service agency.

7. Put in the lower drain plug (P) and secure it.

8. Supply the gear oil to the travelling motor reduction gear case through the upper drain plug hole (P).

☞ Pour in the gear oil until the oil comes out of the oil level check plug (G).

9. Put in the upper drain plug (P) and oil inspection plug (G), and secure them after oil replenishment.

☞ Wipe off the oil completely if spilled.

[5] INSPECT / ADJUST INLET VALVE AND EXHAUST VALVE CLEARANCE

Inspecting and adjusting the inlet and exhaust valve clearance requires special tools.

Contact us or our sales service agency.

6.18.10 MAINTENANCE EVERY 1500 HOURS

Perform this maintenance in tandem with maintenance every 50/100/250/500/1000 hours.

[1] INSPECT / CLEAN / TEST FUEL INJECTOR

Inspection, cleaning, and test of the fuel injector require special tools.

Contact us or our sales service agency.

[2] CHECK CRANKCASE BREATHER

Crankcase breather inspection requires special tools.

Contact us or our sales service agency.

6.18.11 MAINTENANCE EVERY 2000 HOURS

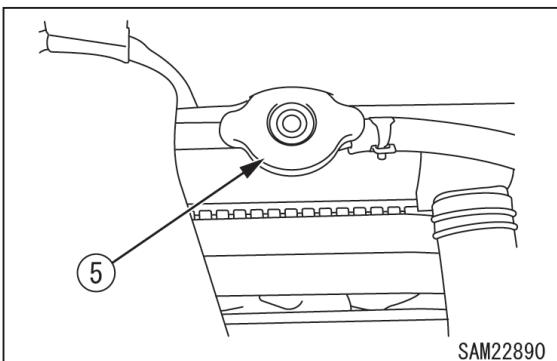
Perform this maintenance in tandem with maintenance every 50/100/250/500/1000 hours.

[1] CHECK / REPLACE ENGINE COOLANT

⚠ WARNING

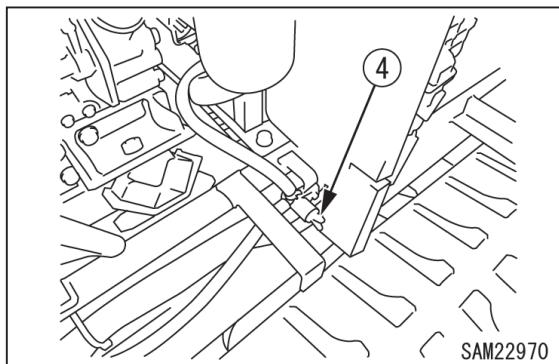
Replace the coolant when the engine is cold. If you remove the radiator cap with the engine at high temperatures, there is a danger of being burnt by the heated coolant blowing out.

1. Place the machine on a level surface.
2. Remove the machinery cover as described in "4.2 REMOTE CONTROL SYSTEM."
3. Ensure that the surface temperature of the radiator cap (5) is as low as can be touched with a bare hand, and slowly turn it until it comes into contact with the stopper to relieve the internal pressure.



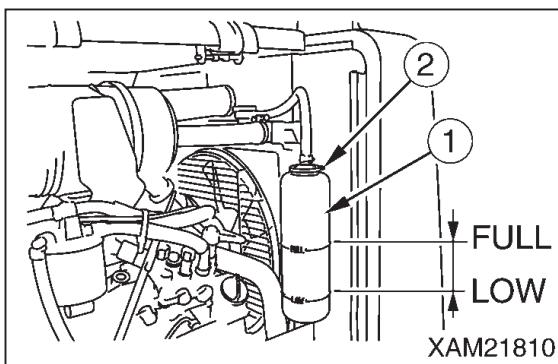
4. Further, remove the radiator cap (5) while turning it until it comes into contact with the stopper.

5. Place a container underneath the drain plug (4) to collect the coolant.



6. Remove the drain plug (4) and drain the coolant.
7. After draining, close the drain plug (4), and inject tap water; when the radiator is filled with water, start the engine, put it in low idling state, raise the water temperature to 90 °C, and run it for approximately 10 minutes.
8. Stop the engine, remove the drain plug (4), and drain the coolant.
9. After draining, clean it using cleaning agent. Clean according to instructions provided on the cleaning agent used.
10. Close the drain plug (4).
11. Fill the coolant from the water inlet. For the mixing ratio of antifreeze and water, refer to "6.18.9 [5] CLEAN INSIDE ENGINE COOLING SYSTEM."
12. Start the engine with the radiator cap (5) removed, and ensure that the engine runs at low idle for 5 minutes. Release air from the cooling system with the engine at high idle for another 5 minutes.
13. Wait for approx. 3 minutes after stopping the engine. Supply tap water (soft water) to the radiator through the radiator supply port, up to the supply port, and close the radiator cap (5).
14. Drain the coolant in the sub-tank and then wash the inside.

15. Supply tap water (soft water) to the "FULL" level from the water supply port of the sub-tank.



16. Reattach the machinery cover as described in "4.2 REMOTE CONTROL SYSTEM."

6.18.12 MAINTENANCE EVERY 3000 HOURS

[1] INSPECT / CLEAN EGR VALVE

For inspection and cleaning, special tools and expertise are required. Contact us or our sales service agency.

6.18.13 IRREGULAR MAINTENANCE

[1] REPLACE RUBBER TRACK

⚠ WARNING

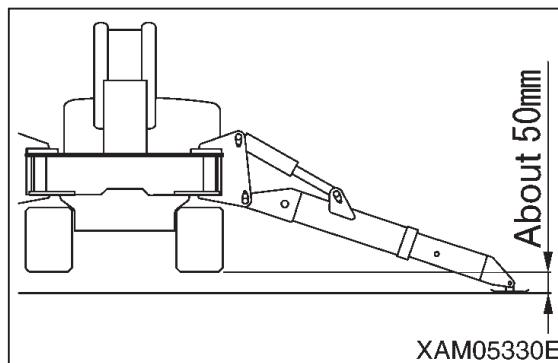
- The inside of the tension adjusting device of the rubber track is greased. Grease is under high pressure associated with the tension of the rubber track. Failure to follow precautions stated below when removing grease may lead to a serious accident due to the grease valve being popping out.
- Only one full turn of the tension adjusting grease valve is allowed to loosen. The grease valve may pop out if disregarded.
- Always stand aside when conducting tension adjustment of the grease valve to circumvent potential dangers.

- Ensure that grease is completely removed from the inside of the rubber track before rotating the sprocket to remove the rubber track.

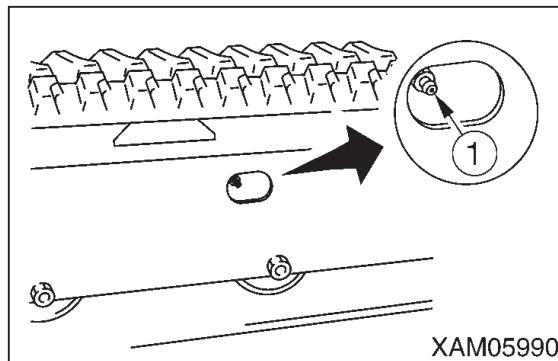
[REMOVAL OF RUBBER TRACK]

- Have a steel pipe available.

- See "5.2.13 OUTRIGGER SETTING" to set the outriggers and raise the rubber track for about 50mm from the ground.

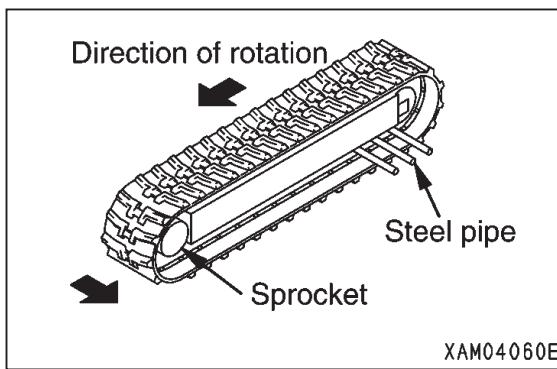


- Loosen the grease valve (1) gradually and remove grease.



- Provide only one full turn of the grease valve (1).

4. Insert the steel pipe between the idler and rubber track. Rotate the sprocket backward.

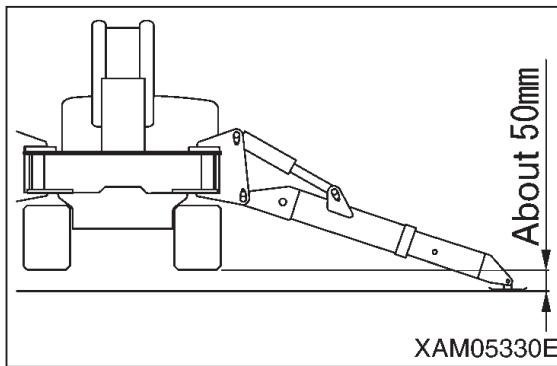


5. When the inserted steel pipe detaches the rubber track from the idler, slide the crawler in a lateral direction to remove it.

[INSTALLATION OF RUBBER TRACK]

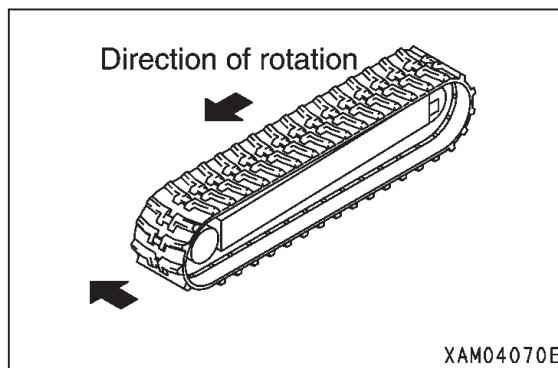
- Have a grease gun available.
- Have a steel pipe available.

1. See “5.2.13 OUTRIGGER SETTING” to set the outriggers and raise the rubber track again for about 50mm from the ground.

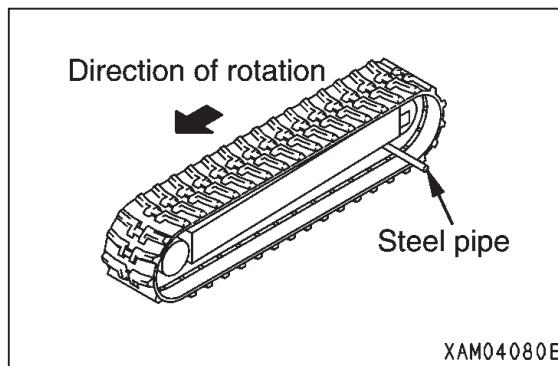


2. With the rubber track engaged with the sprocket, put the crawler on the idler.

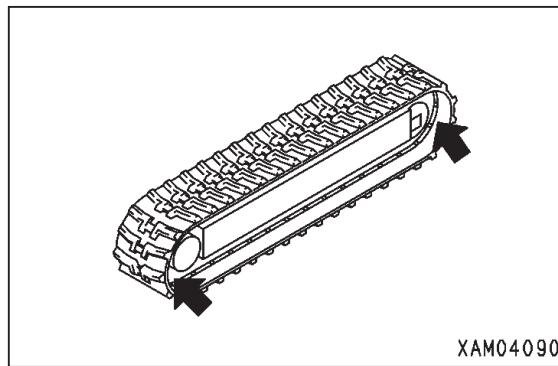
3. With the sprocket rotating backward, push the rubber track in to stop rotation.



4. Insert the steel pipe between the idler and rubber track again, and re-rotate the sprocket to put the crawler on the idler properly.



5. Stop rotation, and ensure that the rubber track is on the sprocket and idler properly.



6. Make a tension adjustment to the rubber track according to “6.12.1.3 [1] CHECK / ADJUST RUBBER TRACK TENSION.”

7. Ensure that adequate engagement and tension of the rubber track, sprocket, and idler are obtained.

8. See “5.2.24 OUTRIGGER STOWING OPERATION” to stow the outriggers and lower the machine on the ground.

[2] REPLACE WINCH WIRE ROPE

[GENERAL INFORMATION AND PRECAUTIONS]

Contact us or our sales service agency for additional information on replacing and repairing wire rope.

⚠ WARNING

Always wear work leather gloves when replacing the wire rope.

⚠ CAUTION

- A diameter of the wire rope is to be measured at points where the wire repeatedly runs through the sheave. A mean value needs to be determined through three-way measurement. (A measurement should be performed at several points, spacing between the points.)
- Do not use the old wire rope regardless of the frequency of use.
- Always use Maeda genuine wire rope.

[WIRE ROPE NOMINAL DIMENSION]

Wire rope for winching:

IWRC 6 x Ws (26) 0/0 φ8 x 95 m

No. 5 wire rope for extending boom:

IWRC 6 x Fi (29) 0/0 φ10 x 8.01 m

No. 5 wire rope for retracting boom:

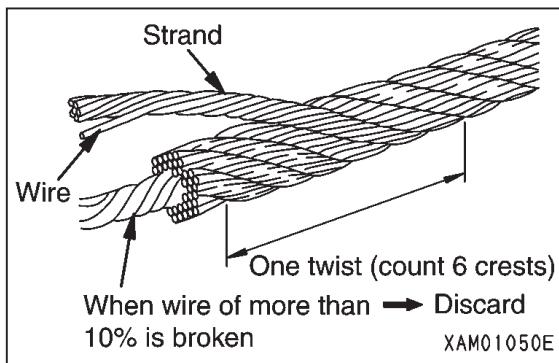
IWRC 6 x Fi (29) 0/0 φ8 x 14.46 m

[INSPECTING WIRE ROPE]

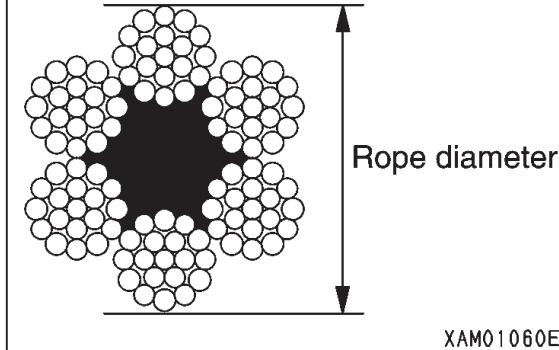
A wire rope undergoes wear and tear over time.

Prompt replacement is required if any of the following events appears in the wire rope.

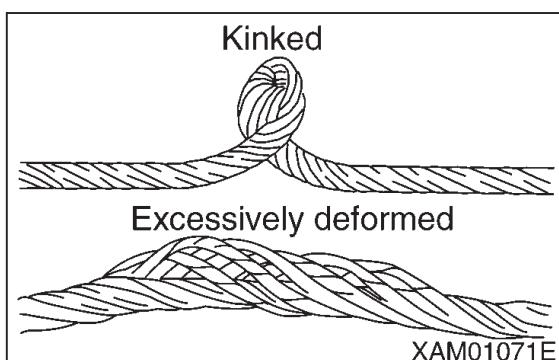
- 10% or more of strands (except a filler wire) in a twist of the wire rope (6 crests) is broken.



- ☞ Replace the wire rope for winching if 9 strands or more are broken and one for boom extending/retracting if 13 strands or more are broken.
- Wear equivalent to 7% or more of a nominal diameter occurs in the wire rope diameter.



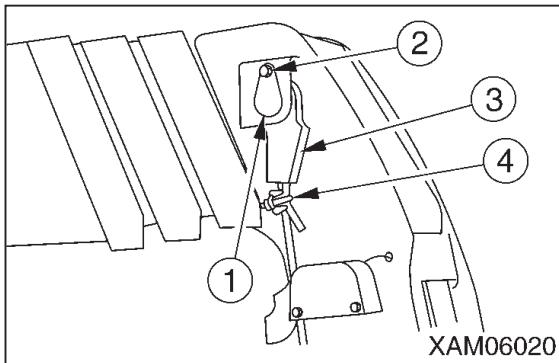
- ☞ Replace an 8-mm-dia wire rope if it is 7.5mm in diameter.
- ☞ Replace a 10-mm-dia wire rope if it is 9.3mm in diameter.
- A kink is formed.
- Considerable deformation or corrosion is developed.
- A faulty end socket is used.



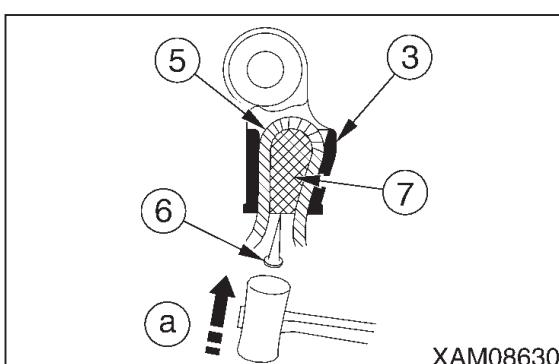
[WINCH WIRE ROPE - REMOVAL]

Use the following procedure to remove the wire rope.

1. Place the machine on a level and firm surface.
2. Place the boom telescoping lever in the "Extend" position (push it toward the front) to extend the boom slightly.
3. Place the winch lever in the "Down" position (push it toward the front) to lift down the hook block on the ground.
4. Undo the wedge socket fixing bolt (2). Remove the wedge socket pin (1) and remove the wedge socket (3).



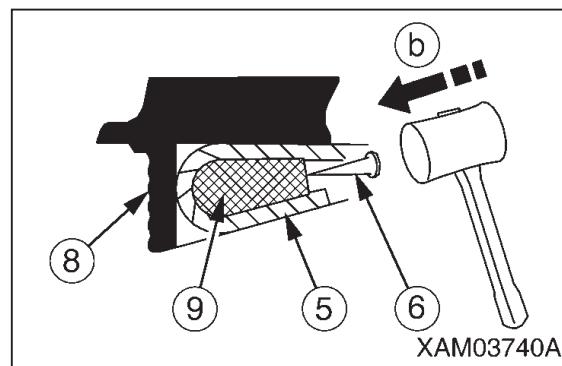
5. Remove the wire clip (4).
6. Pull the wire rope (5) out of the wedge socket (3), following the procedure provided below.
 1. Bring a 4 to 6mm round bar (6) into contact with the rope wedge (7).
 2. Remove the rope wedge (7), lightly tapping the round bar (6) with a hammer in the direction indicated by the arrow (a).
- 3.



7. Place the winch lever in the "Down" position (push it toward the front) to wind up the wire rope (5) from the winch drum.

8. With the wire rope wound up from the winch drum, detach the end of the wire rope (5) from the winch drum (8) by following the procedure provided below.

1. Bring a 4 to 6mm round bar (6) into contact with the rope wedge (9).
2. Remove the rope wedge (9), lightly tapping the round bar (6) with a hammer in the direction indicated by the arrow (b).



9. Wind up the remaining wire rope (5) completely.

Removal of the winch wire rope is completed.

[WINCH WIRE ROPE - INSTALLATION]

⚠ WARNING

Be sure to attach the rope wedge properly to secure the wire rope. Potential serious accident may occur due to detachment of the wire rope during crane operation if disregarded.

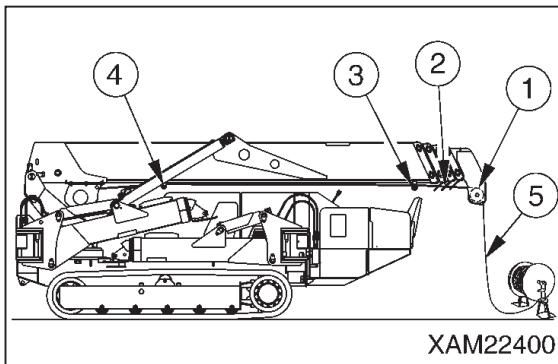
⚠ CAUTION

- Avoid irregular winding of the wire rope in the winch drum.
- Always hoist an object (2.9 to 4.9KN {300 to 500kg}) with the boom extended and raised fully immediately after attaching a new rope. Repeat hoisting up and down the hook several times until the new rope conforms.
- The wire rope is coiled. Exercise caution not to form a kink in the rope when winding it up.

Be sure to unrove by rotating the rope to pull it out of the winch drum.

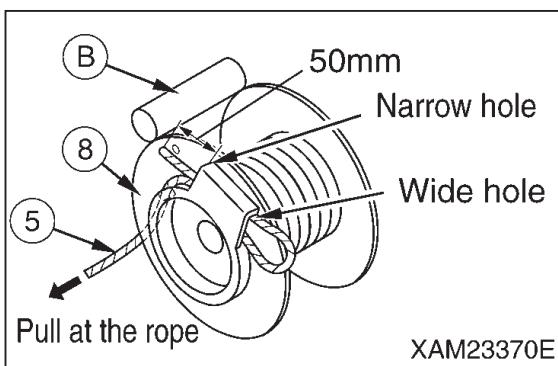
Use the following procedure to attach the wire rope.

- With the end of the wire rope held, draw the wire rope (5) through the weight of the overwinding detector, load sheave (1) at the boom end, wire guide (2) of No.2, 3, and 4 boom, snap sheave (3), and idler sheave (4).

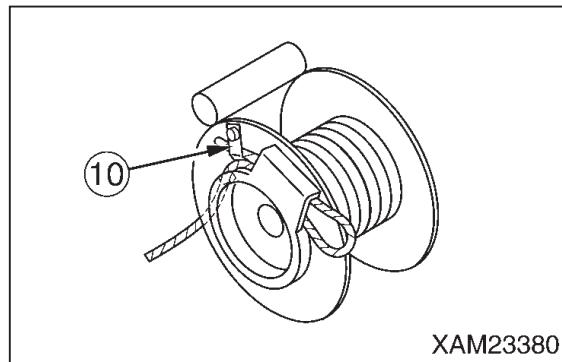


- Draw the wire rope (5) through the attachment hole of the winch drum (8). Secure the wire rope (5) to the winch drum (8), following the procedure provided below.

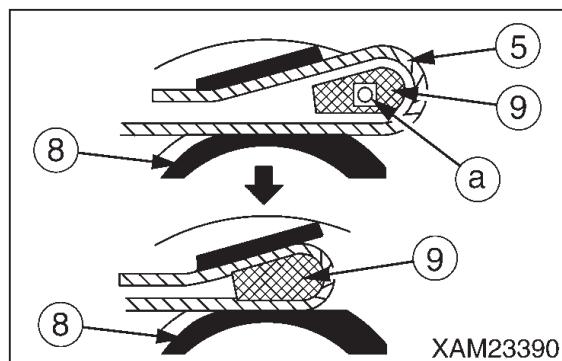
- Draw the wire rope (5) through the winch drum (8) with the rope loose.



- The rope wedge (9) should be in position (a). Pass the wire rope (5) around the rope wedge and yank at the rope in the direction indicated by the arrow. Let the wire rope (5) protrude approximately 50 mm out of the narrow hole in the winch drum (8), then fix the end of the wire rope (5) with the plate (10).

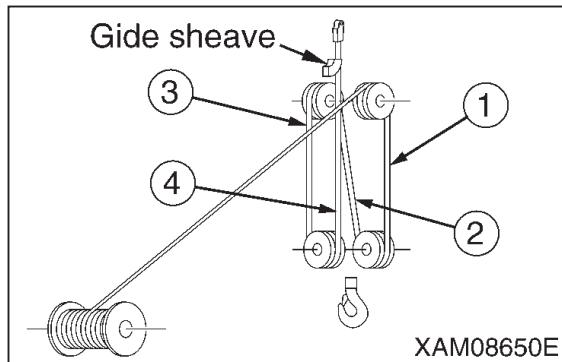


- Place the winch lever in the "Up" position (pull it toward you) slowly to wind up the wire rope (5) in the winch drum (8). Ensure that the wire rope is coiled between the irregular winding protective roller (B) and winch drum. The wire rope needs to jut out the boom end (approx. 10m).

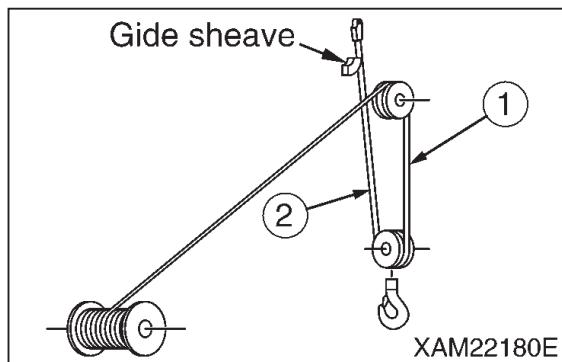


4. In response to the number of falls, draw the wire rope through the load sheave at the boom end, hook block sheave, guide sheave, and retraction cam.

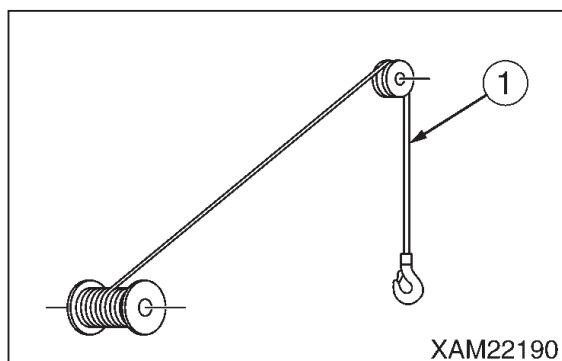
A. 4-falls



B. 2-falls

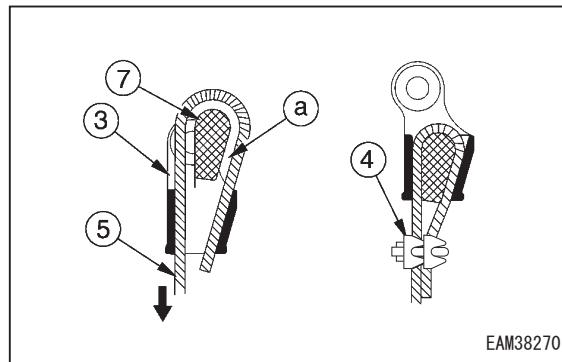


C. 1-fall



5. Secure the end of the wire rope (5) to the wedge socket (3), following the procedure provided below.

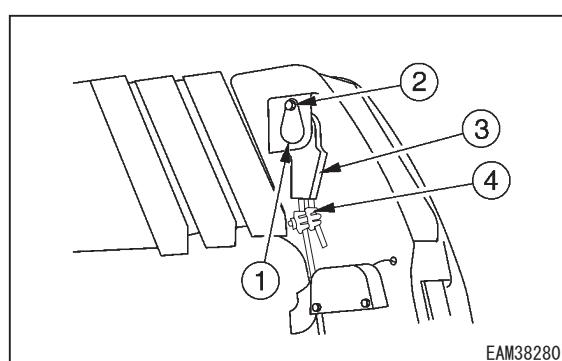
1. Draw the wire rope (5) through the wedge socket (3).



2. With the rope wedge (7) in position (a), yank at the wire rope (5) in the direction indicated by the arrow.

6. Attach the rope clip (4) to the wire rope (5).

7. Secure the wedge socket (3) to the boom with the wedge socket pin (1), and tighten the wedge socket fixing bolt (2).



8. Place the boom derricking lever in the "Raise" position (pull it toward you) or the boom telescoping lever in the "Extend" position (pull it toward you) to lift up the hook block.

☞ Winch operation is allowed only after the hook block is lifted up.

9. With the boom extended and raised fully, place the winch lever in the "Down" position (push it toward the front) to adjust the wire rope (5) until 3 to 4 turns of wire are left in the winch drum (8).

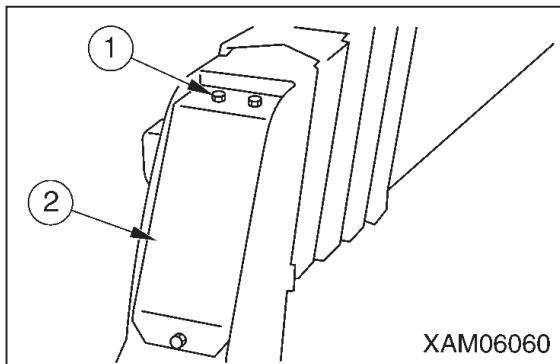
10. With the wire rope (5) held under tension, place the winch lever in the "Up" position (pull it toward you) to wind up the wire rope (5) in the winch drum (8).

[3] CHECK / ADJUSTING BOOM TELESCOPING WIRE ROPE

[CHECKING BOOM TELESCOPING WIRE ROPE]

Prompt adjustment is required if the following event appears in the boom extending wire rope.

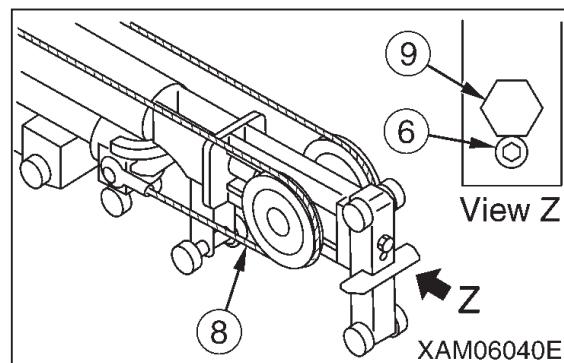
1. Retract the boom completely.
2. Remove three mounting bolts (1) at the boom end and remove the cover (2).



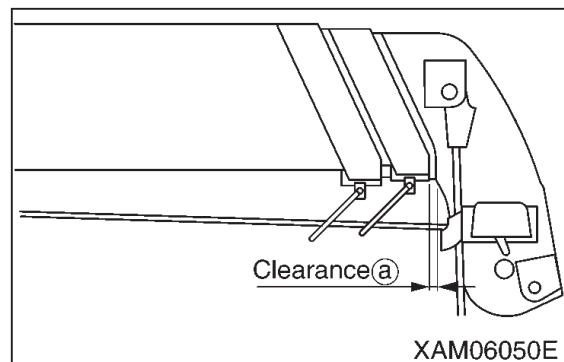
3. Remove lock bolt (6) at the boom telescoping cylinder top, and turn adjustment bolt (9) of the boom extending wire rope clockwise (right).
The boom extending wire rope (8) is adjusted to the correct tension if boom No.5 extends upon rotating the adjusting

bolt (9).

If boom No.5 remains retracted, perform proper adjustment according to [ADJUSTMENT OF BOOM TELESCOPING WIRE ROPE].



4. Check that 5-mm clearance is formed between booms No.4 and No.5, clearance (a), with the booms retracted in a horizontal position.
If check finds clearance of 5mm or more, perform proper adjustment according to [ADJUSTMENT OF BOOM TELESCOPING WIRE ROPE].



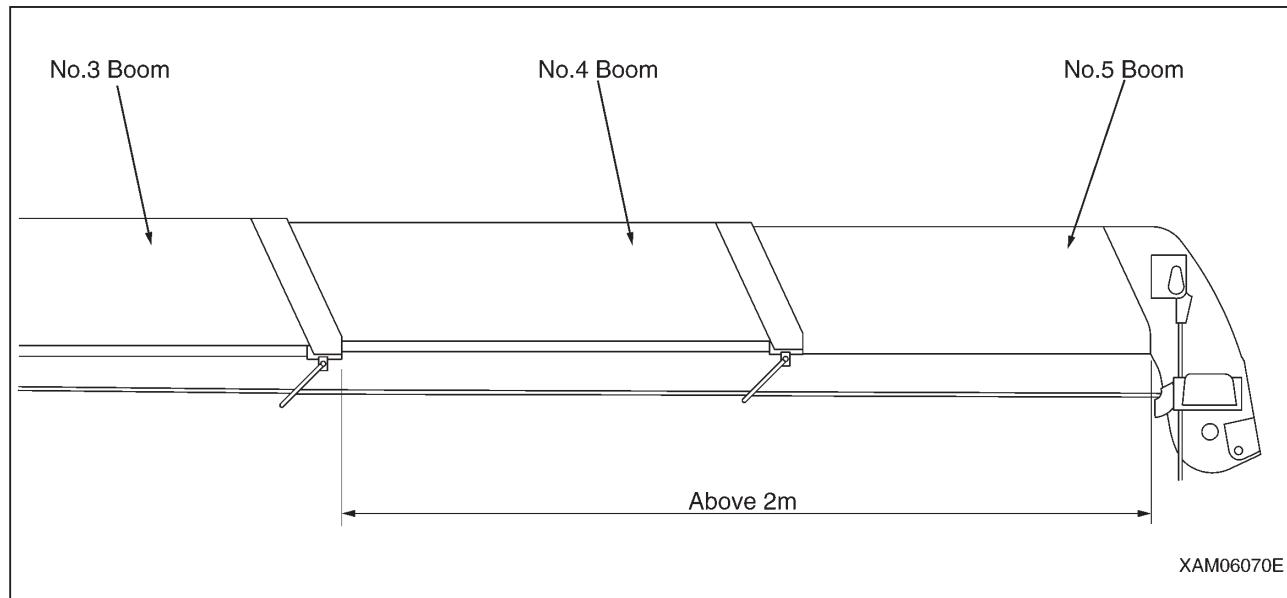
[ADJUSTMENT OF BOOM TELESCOPING WIRE ROPE]

⚠ CAUTION

The wire ropes must be adjusted to the correct tightness.

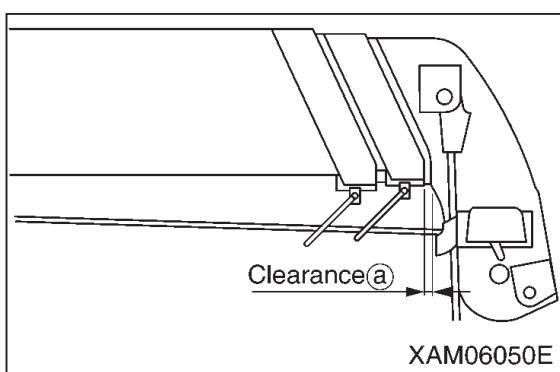
A boom extending wire rope (1 piece) and retracting wire rope (1 piece) are used in this machine. Adjustment of these wire ropes must conform to the specified procedure. Use the following procedure for wire rope adjustment.

1. With the booms retracted in a horizontal position, extend the telescoping booms approx. 2m.



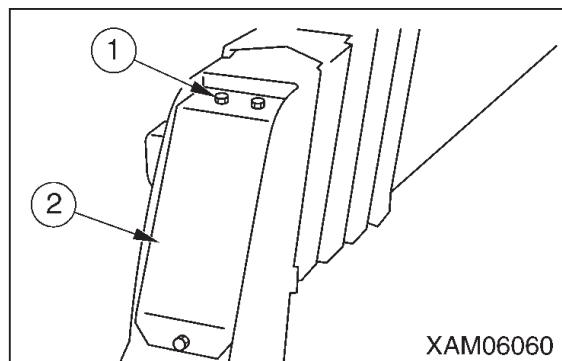
2. Retract the booms completely. Boom stowing is required.

Measure clearance (a) to check the following for proper adjustment.



3. Remove the three mounting bolts (1) at the boom end and remove the cover (2).

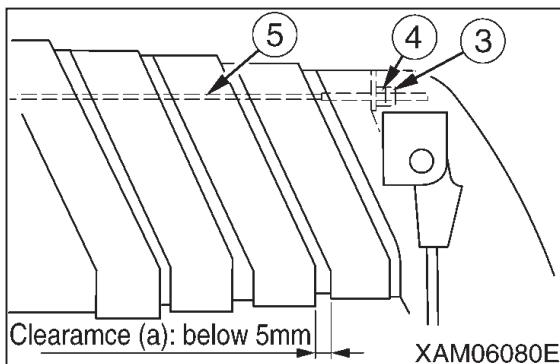
If sag is developed in the wire rope, adjust the wire rope according to [ADJUSTMENT OF BOOM TELESCOPING WIRE ROPE].



- If 5-mm or more clearance is formed, adjust the retracting wire rope (5) of boom No.5.
- If no clearance is formed, perform wire rope adjustment from section 5 "Adjustment of boom No.5 extending wire rope (8)".

4. Adjustment of boom No.5 retracting wire rope (5)

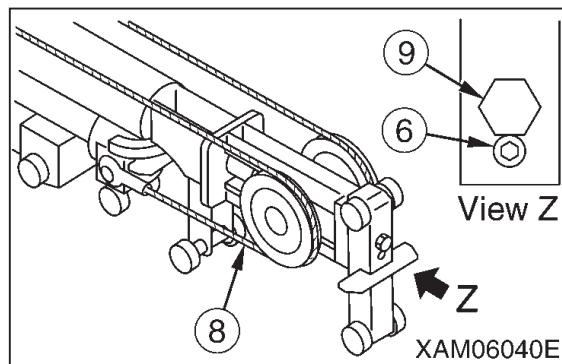
1. With the lock nut (3) loose, turn the adjusting nut (4) in the direction that the retracting wire rope (5) becomes tight (clockwise (right)) to provide laterally even tightening until clearance (a) is bridged.



2. If the retracting wire rope remains sagging or 5-mm or more clearance remains present after performing steps 1 and 2, readjustment is required.

5. Adjustment of boom No.5 extending wire rope (8)

1. Remove the lock bolt (6). Turn the adjusting bolt (9) in the direction that the extending wire rope (8) of boom No.5 becomes tight (clockwise (right)) to provide tightening to the verge of the extension of boom No.5.



2. Provide retightening to both adjusting nuts (4) of the boom No.5 retracting wire rope (5) two turns each.

3. Secure the adjusting nuts (4) of the boom No.5 retracting wire rope (5) with the lock nut (3).

4. Provide retightening to both adjusting bolt (9) of the boom No.5 extending wire rope (8), and secure it with the lock bolt (6).

6. Install the cover (2) to the boom end with the three mounting bolts (1) upon completion of adjustment.

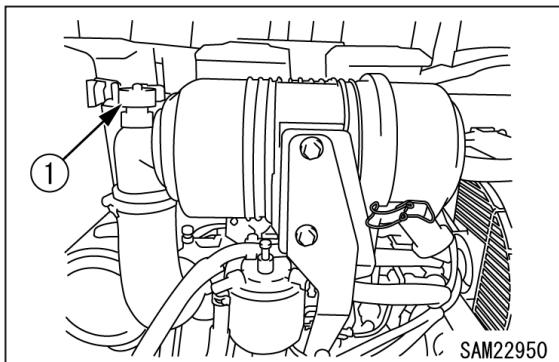
[4] INSPECT / CLEAN / REPLACE AIR CLEANER

⚠ WARNING

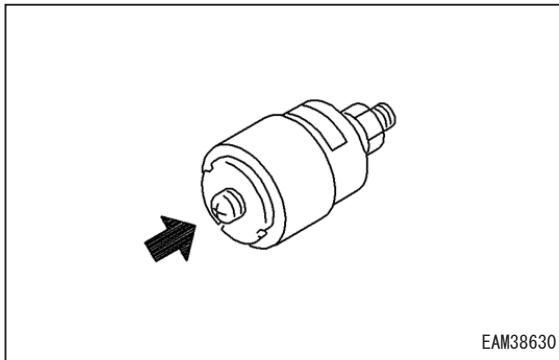
- **Conducting inspection/cleaning maintenance while the engine is running may allow the entry of rubbish into the engine and damage the engine. Conduct after stopping the engine.**
- **When using compressed air, rubbish can fly in all directions and may cause personal injuries. Wear goggles, dust mask and other protective equipment.**

[INSPECTION]

1. Remove the machinery cover as described in "4.2 REMOTE CONTROL SYSTEM."
2. Inspect the dust indicator (1) on the air cleaner to check that the red piston is not visible in the transparent section.



3. If the red piston is visible, clean or replace the element immediately

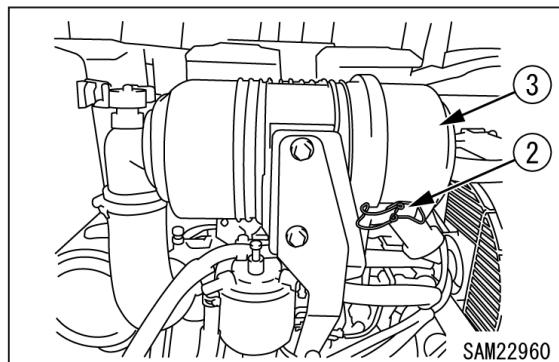


4. After inspecting, cleaning or replacing, press the knob on the dust indicator (1) to return the red piston to its original position.
5. Reattach the machinery cover as described in "4.2 REMOTE CONTROL SYSTEM."

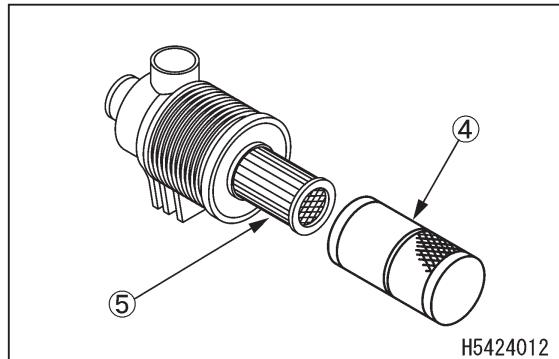
[CLEANING/REPLACING THE ELEMENT]

1. Remove the machinery cover as described in "4.2 REMOTE CONTROL SYSTEM."

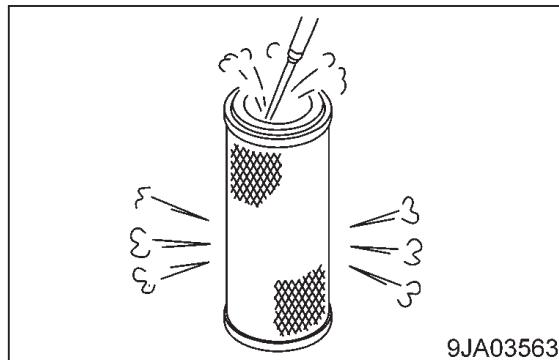
2. Remove the air cleaner clip (2), and remove the dust cup (3).



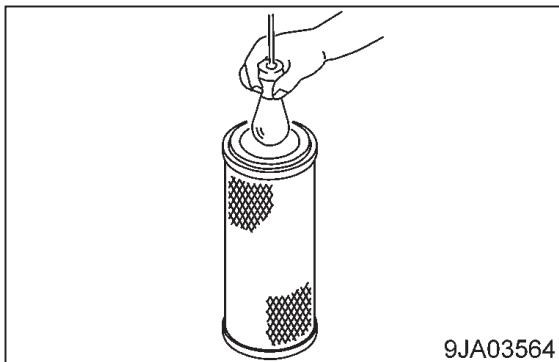
3. Dispose of the rubbish in the dust cup (3) and clean the interior.
4. Remove the element (4) on the outside of the double element.



5. Clean the inside of the air cleaner body.
6. Apply dry compressed air (0.29 to 0.49 MPa) from the inner side of the element along the fold. Blow compressed air on the outside of the element along the grooves, and re-blow the air on the inside.



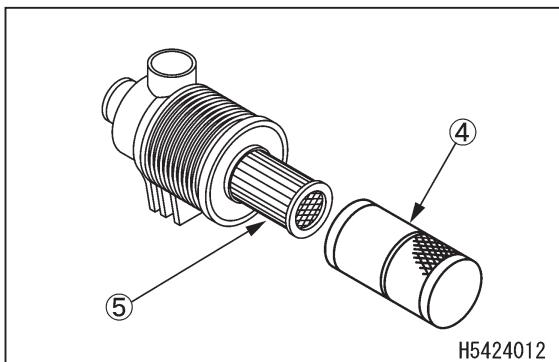
7. Check the inside of the element by illuminating with a light bulb and if any pores or thinned parts are found, replace the element.



⚠ CAUTION

Do not tap or bump the element while cleaning it. Avoid the use of an element if the groove, gasket, or sealing is damaged. Pack the unused elements and store them in a dry place.

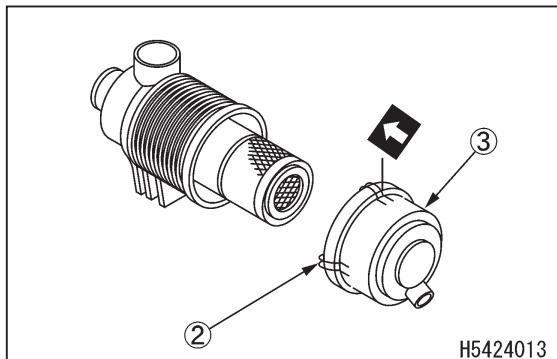
8. Set the cleaned outside element (4).



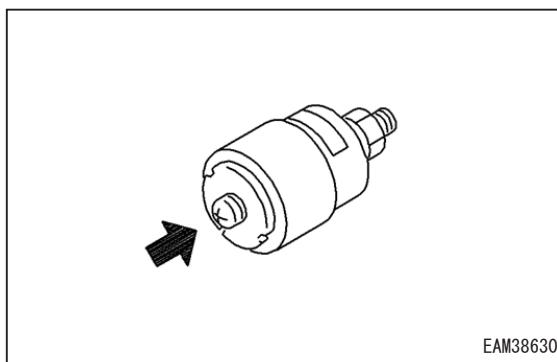
⚠ CAUTION

If the filter still clogs quickly despite having cleaned or replaced outside element (4), replace the inside element (5).

9. Match the match mark on dust cup (3) and the match mark on the air cleaner body and fix with clip (2).



10. Press the button on the dust indicator (1) to return the red piston.



11. Reattach the machinery cover as described in “4.2 REMOTE CONTROL SYSTEM.”

[5] CLEAN INSIDE ENGINE COOLING SYSTEM

⚠ WARNING

- Coolant temperature is high immediately after stopping the engine and pressure is accumulated in the radiator. Removing the cap in this state for discharging water may cause burns. Allow it to cool down, and then slowly turn the cap to relieve the pressure.
- Start and clean the engine. Before standing up from the operator's seat or leaving it, set the lock lever to LOCK.
- For starting the engine, see “6.12.1.2 PRE-START INSPECTION - BEFORE STARTING ENGINE” and “5.2.2 STARTING ENGINE.”

- While cleaning, the engine is kept running, and thus it is dangerous to stay in the rear of the engine. While running the engine never enter the rear section of the machine.

Stop the machine on a level place and perform cooling system cleaning or coolant replacement.

Cooling system cleaning and coolant replacement should conform to the cycles specified in the following table.

Coolant type	Cooling system cleaning and replacement
Super coolant AF-NAC	Every 2 years (in fall) or every 2000 hours, whichever falls first

While the mixing proportion of coolant varies with temperature, a volumetric proportion of 30% at a minimum is required.

Even in areas where anti-freezing is not needed, use the super coolant at a minimum proportion of 30% to prevent corrosion of cooling system.

The mixing proportion of water and coolant is determined with respect to past minimum temperatures, in accordance with "Mixing proportion of water and coolant" shown below. For actual mixing, set temperature approx. 10°C lower than minimum temperature.

Freezing temperature of 100% undiluted super coolant is -15°C. Be careful not to store the undiluted super coolant below -15°C.

[TABLE OF MIXING PROPORTION OF WATER AND SUPER COOLANT]

Min. temperature (°C)	-10 or more	-15	-20	-25	-30
Mixed quantity (L)					
Super coolant quantity	1.7	2.0	2.3	2.5	2.8
Water amount	3.8	3.5	3.2	3.0	2.7

⚠ WARNING

- Since the undiluted super coolant is flammable, be cautious of fire.
- The super coolant is toxic. When removing the drain plug, be careful not to get exposed to splashes of the super coolant solution. If it gets in the eyes, wash immediately and thoroughly with water and seek medical attention.
- The disposal of coolant added with the super coolant discharged when replacing the coolant and repairing the radiator should be consigned to a specialised subcontractor, or contact us or our sales service agency. Since the super coolant is toxic, never drain it into drainage or sprinkle it on the ground.

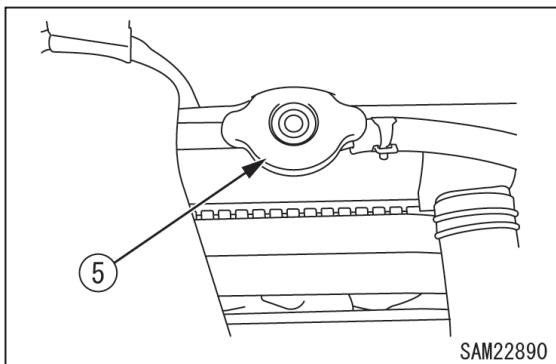
⚠ CAUTION

For the coolant, use genuine Maeda super coolant (AF-NAC). Use of any other coolants than genuine Maeda super coolant (AF-NAC) is not recommended in principle.

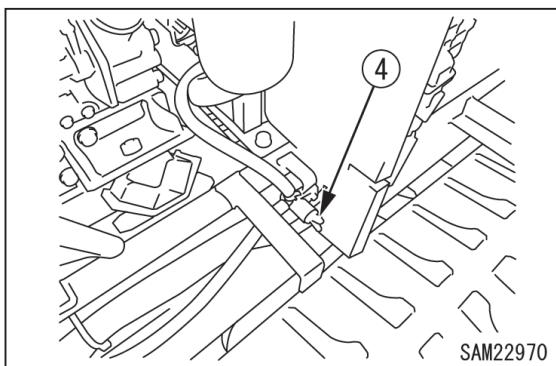
Always use tap water when diluting. Contact us or our sales service agency if river water, well water, or water through the small water-supply system is necessarily substituted for tap water. The mixing proportion of super coolant is recommended to be controlled by using the super coolant concentration meter.

[CLEANING METHOD]

1. Remove the machinery cover as described in "4.2 REMOTE CONTROL SYSTEM."
2. Ensure that the surface temperature of the radiator cap (5) is as low as can be touched with a bare hand, and slowly turn it until it comes into contact with the stopper to relieve the internal pressure.

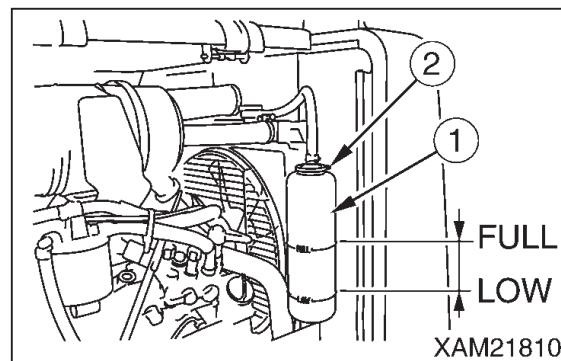


3. Further, remove the radiator cap (5) while turning it until it comes into contact with the stopper.
4. Place a container underneath the drain plug (4) to collect the coolant.



5. Remove the drain plug (4) and drain the coolant.
6. After draining, close the drain plug (4), and inject tap water; when the radiator is filled with water, start the engine, put it in low idling state, raise the water temperature to 90 °C, and run it for approximately 10 minutes.
7. Stop the engine, remove the drain plug (4), and drain the coolant.

8. After draining, clean it using cleaning agent. Clean according to instructions provided on the cleaning agent used.
9. Close the drain plug (4).
10. Inject super coolant and tap water from the water inlet up to the mouth. For the mixing proportion of water and the super coolant, see [TABLE OF MIXING PROPORTION OF WATER AND SUPER COOLANT] on 6-87 .
11. To remove air mixed into the coolant, operate at low idling for 5 minutes, and a further 5 minutes at high idling. (Keep the coolant cap off at this time.)
12. Drain the coolant from the sub-tank, clean the interior of the sub-tank, and fill with coolant up to the middle point of FULL-LOW.



13. Stop the engine, wait approximately 3 minutes, fill with tap water up to near the water inlet, and tighten the cap.
14. Reattach the machinery cover as described in "4.2 REMOTE CONTROL SYSTEM."

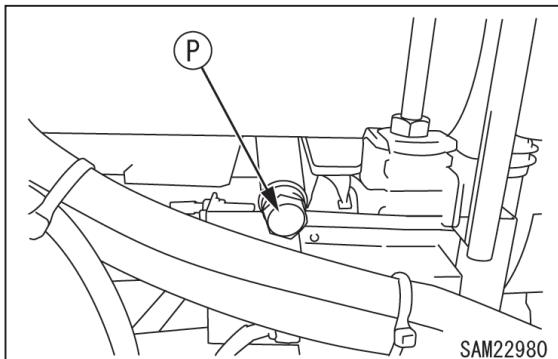
[6] DRAIN CONTAMINANT WATER/DEPOSITS IN FUEL TANK**⚠ WARNING**

- **Keep from heat and flame, including cigarettes.**

- Be sure to stop the engine before draining fuel.
Potential ignition may occur through spilled fuel if disregarded.
- Always put in the fuel tank drain plug and secure it after draining fuel.
- The fuel tank drain plug is located directly beneath the machine.
When draining the fuel, use the outriggers to raise the machine and allow access beneath the machine. If the machine is unstable and shaky, place support blocks under the machine body at the front and rear to stabilise it.

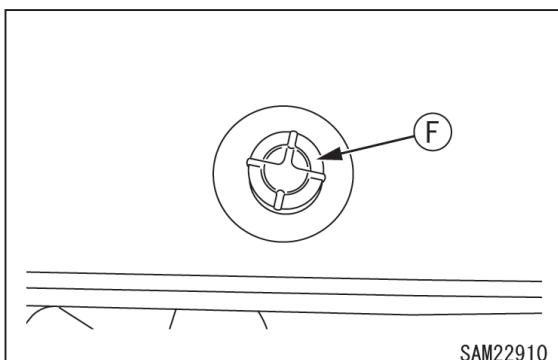
- Fuel drain pan: A 1-litre container

1. Place the machine on a level surface.
2. Remove the machinery cover as described in "4.2 REMOTE CONTROL SYSTEM."
3. Place a drain pan directly under the fuel tank drain plug (P) to receive drained fuel.



4. Remove the drain plug (P) slowly to drain fuel, keeping from contact with draining fuel.

☞ Remove the fuel tank cap (F) if normal or smooth fuel draining fails.



5. Put in the drain plug (P) and secure it upon completion of draining fuel.

☞ Wipe off fuel completely if spilled.

6. Reattach the machinery cover as described in "4.2 REMOTE CONTROL SYSTEM."

[7] DRAIN CONTAMINANT WATER/DEPOSITS IN WATER SEPARATOR

⚠ WARNING

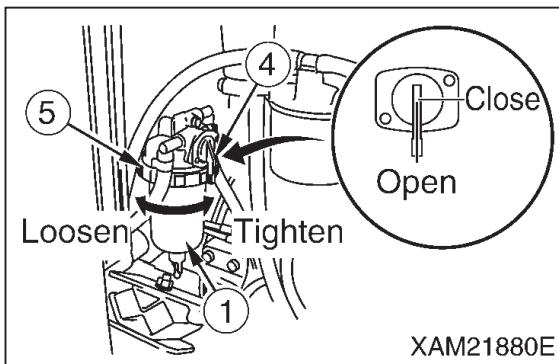
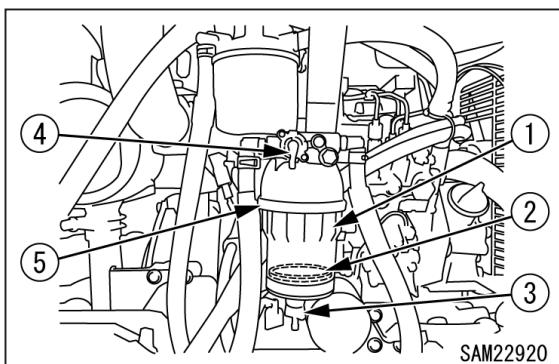
- The water separator pot has fuel (diesel oil) inside. Be extremely careful of fire such as cigarette when cleaning the water separator pot.
- If the fuel spills when the water separator pot is removed, thoroughly wipe it off.

⚠ CAUTION

Water or dust accumulated inside the water separator pot will cause engine failure. Check inside the pot and remove any water or dust accumulated inside.

1. Place the machine on a level surface.
2. Remove the machinery cover as described in "4.2 REMOTE CONTROL SYSTEM."

- Set the fuel lever (4) on the water separator pot (1) to a horizontal position (Close position) to stop fuel supply.



- Turn the retaining ring (5) counterclockwise (left) to loosen it, and remove the water separator pot (1).
- Clean the inside of the pot (1) and element with diesel oil. Blow dry compressed air on the inside of the pot at (0.20 to 0.29MPa {2 to 3kg/cm²}) to remove impurities from the internal surface.
- Put the pot (1) in place, and turn the retaining ring (5) clockwise (right) to tighten it.
- Set the fuel lever (4) to a vertical position (Open position).

☞ Wipe off fuel completely if spilled.

- Use the following procedure for air bleed of the fuel system.

- Turn ON the starter switch to supply fuel, and wait until the pot (1) is filled up.
- Upon fill-up of the pot (1), turn OFF the starter switch.
- Ensure that a red float (2) in the pot remains on the bottom. If the red float (2) is raised, water is present in fuel.

- Remove the machinery cover as described in "4.2 REMOTE CONTROL SYSTEM."

6.19 RUBBER TRACKS

General Information and Precautions

6.19.1 GOOD USE

While the rubber tracks demonstrate many advantages thanks to its performance characteristic to the material, it has a weak point in strength.

Therefore, we would like you to sufficiently understand the characteristics of the rubber tracks and to respect don'ts operations and observe the cautions on handling so that the life of the rubber tracks can be extended and its advantages exercised.

Be sure to read "6.19.3 DOS AND DON'TS" and "6.19.4 CAUTIONS IN USING RUBBER TRACKS" before using the machine.

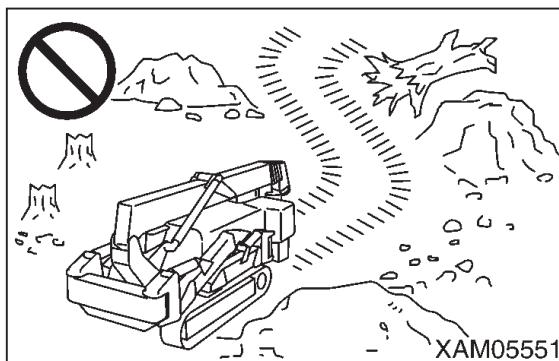
6.19.2 WARRANTY

Verification of proper tension of the rubber tracks, maintenance of rubber tracks, and damage caused by the fault of customers such as not respecting don'ts operation or not observing cautions in working, for example, "worked at the site where there were objects that may tear the rubber blocks, such as steel plates, U-shaped gutters, corners of bricks, corners of sheer broken stones and rocks, reinforcing steels, and iron scraps", are not covered by warranty.

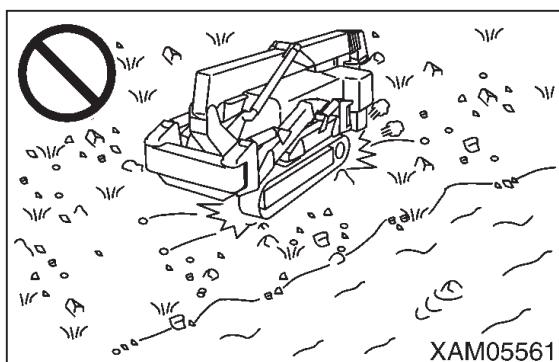
6.19.3 DOS AND DON'TS

The following operations are prohibited.

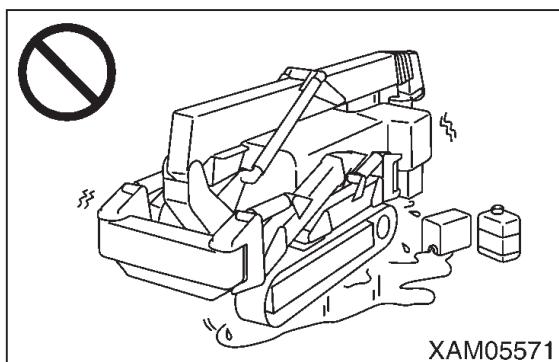
- Working and slewing on the ground with broken stones, hard rock ground with great irregularity, reinforcing steels, iron scraps, and near the edge of the steel plates will damage the rubber tracks.



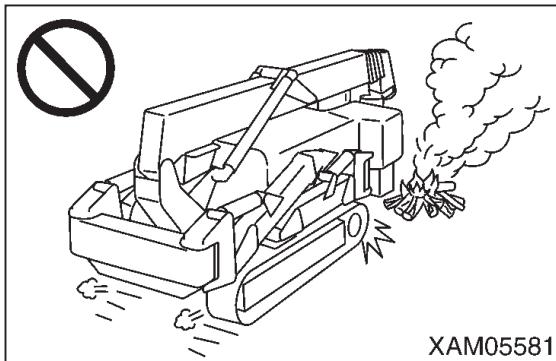
- At the location where there are great amount of large and small boulder stones such as river beds, the stones will go under the machine, tending to damage the rubber tracks or the rubber tracks tend to come off.



- Keep the oil and chemical solvents away from the rubber tracks.
If these materials come in contact with the rubber tracks, wipe it off immediately.
Do not Travel over the road surface where the oil has built up.



- Do not go in the area where it is hot such as with open fire, the steel plate left under the burning sun, or newly poured asphalt.



- Keep the rubber tracks indoor where there is no direct sunlight or rain when storing them for long time (three months or more).

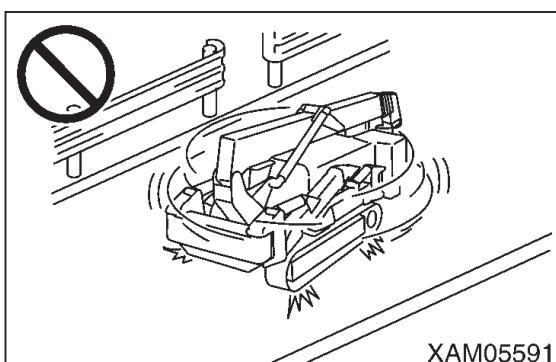
6.19.4 CAUTIONS IN USING RUBBER TRACKS

⚠ WARNING

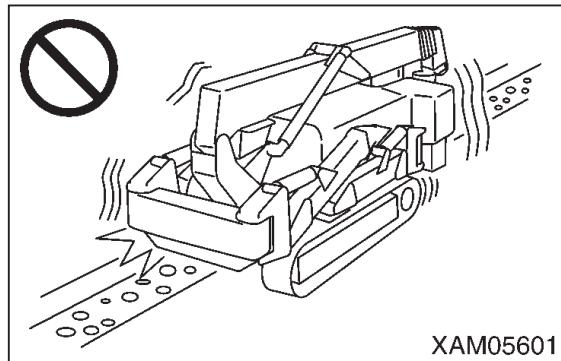
Not observing these cautions in using rubber tracks will cause serious accidents or damage on rubber tracks.

Keep the followings in mind during the operation.

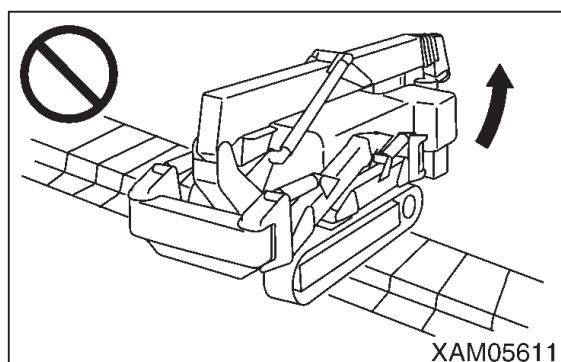
- Avoid making spin turns on the concrete surface.
Sudden steering cause early wear or defect on the rubber tracks. Avoid making sudden steering whenever possible.



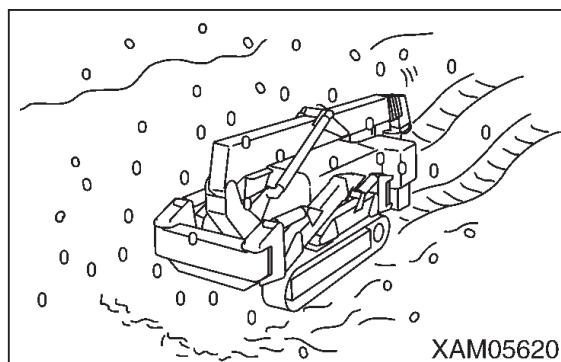
- Do not operate the machine in a way that the edge of the rubber tracks is pressed against the concrete and walls.



- Avoid steering at the location with a great step.
Make the machine perpendicular to the step when going over it.
Going over the step diagonally may result in the rubber tracks coming off.

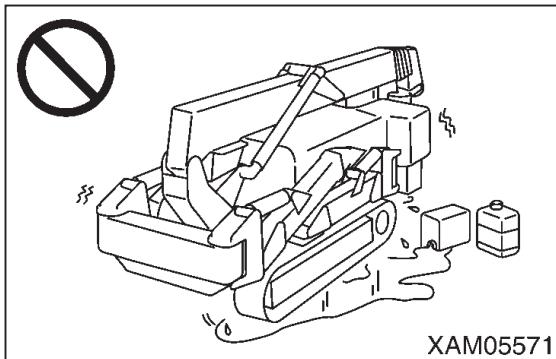


- The rubber tracks slip very easily on a wet steep plate or snowed and frozen surface.
Be especially careful not to slip when operating on the slope.

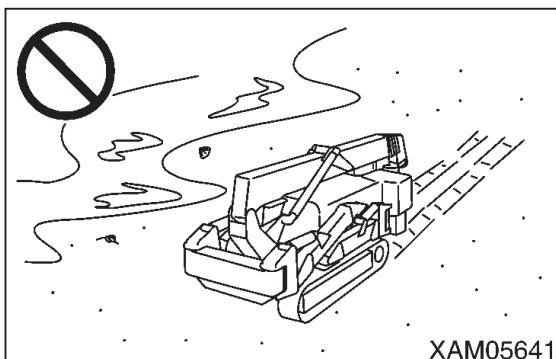


- Avoid using the rubber tracks whenever possible depending on the material to be worked on.
If you used the rubber tracks on these materials by necessity, wash thoroughly with water after the use.

- Avoid the operation on the material crushed and yielding oil (such as soy beans, corns, rape cake, etc.)
- Handling salt, ammonium sulfate, potassium chloride, or concentrated superphosphate corrodes the bonding at the cored bar section.



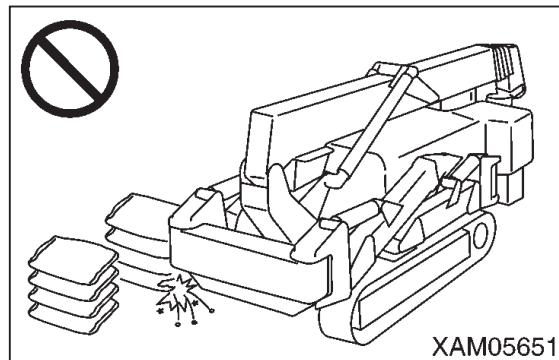
- Salt corrodes the bonding at the cored bar section. Avoid using the machine on the beach whenever possible.



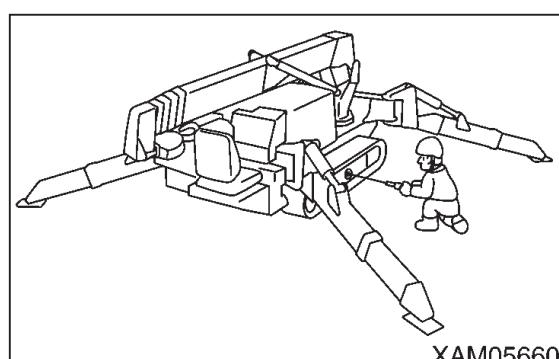
- The operation in the very cold land changes the material of the rubber tracks, shortening its life.

Use the rubber tracks in the range of -25°C to +55°C, due to the physical property of the rubber.

- When handling food such as salt, sugar, wheat, and soybeans, some pieces of wire or rubber may be mixed in the food if there is any deep scratch on the rubber tracks. Use the rubber tracks after repairing the cracked rubber.



- Always use the rubber tracks at appropriate tension to prevent the rubber track from coming off. Loose tension will allow the rubber tracks to come off.



6.20 WIRE ROPE

6.20.1 CRITERIA FOR WIRE ROPE REPLACEMENT

IMPORTANT

- The criteria for replacing wire ropes is common to all the wire ropes for winching, telescoping the boom, and slinging.
- The diameter of the wire rope is measured at points where the wire rope repeatedly runs through the sheave. A mean value needs to be determined through 3 way measurement.
- Do not use old wire rope regardless of the frequency of use.
- See “6.18.13 [2] REPLACE WINCH WIRE ROPE” for details.
- Contact us or our sales service agency for replacing/repairing the wire ropes.

[1] WIRE ROPE NOMINAL DIMENSION

Wire rope for winching:

IWRC 6 x Ws (26) 0/0 φ8 x 95 m

No. 5 wire rope for extending boom:

IWRC 6 x Fi (29) 0/0 φ10 x 8.01 m

No. 5 wire rope for retracting boom:

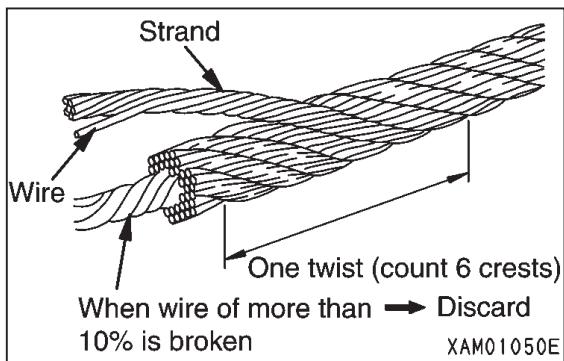
IWRC 6 x Fi (29) 0/0 φ8 x 14.46 m

[2] INSPECTING WIRE ROPE

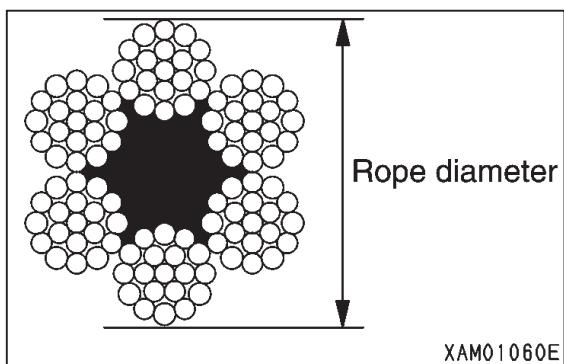
A wire rope undergoes wear and tear over time.

Prompt replacement is required if any of the following events appears in the wire rope.

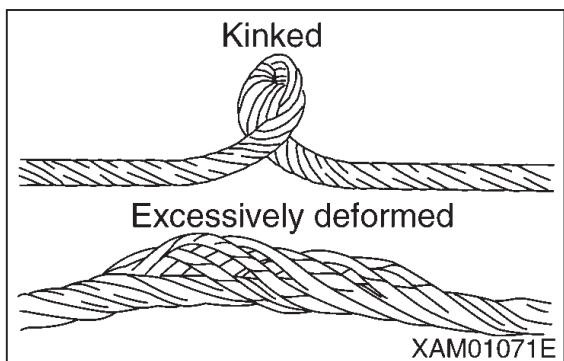
- 10% or more of strands (except a filler wire) in a twist of the wire rope (6 crests) is broken.



- ☞ Replace the wire rope for winching if 9 strands or more are broken and one for boom extending/retracting if 13 strands or more are broken.
- Wear equivalent to 7% or more of a nominal diameter occurs in the wire rope diameter.



- ☞ Replace an 8-mm-dia wire rope if it is 7.5mm in diameter.
- ☞ Replace a 10-mm-dia wire rope if it is 9.3mm in diameter.
- A kink is formed.
- Considerable deformation or corrosion is developed.
- A faulty end socket is used.



6.20.2 WINCH WIRE ROPE - CORRECTING TWISTED ROPE

⚠ WARNING

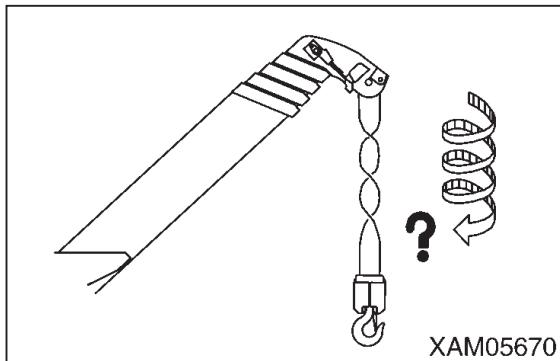
Be sure to wear a pair of thick leather working gloves when handling wire ropes.

⚠ CAUTION

Change the hooking direction of the wire rope (inverse the hook block side and winch drum side) from time to time to extend the life of the wire rope.

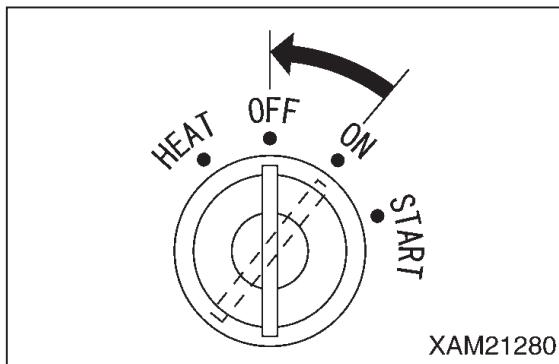
When the wire rope gets twisted, straighten the twist with the following procedure.

1. With the hook in normal condition, check the twisting direction and how many times the rope is twisted.

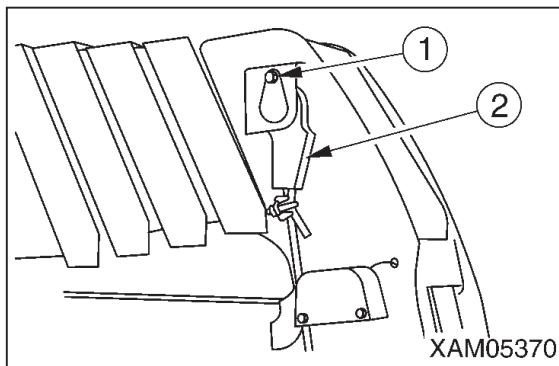


2. Operate the winch lever to "DOWN" (push forward) side to hoist down the hook block onto the ground. If the hook cannot be hoisted down, operate the boom derrick lever to the "LOWER" (push forward) side to lower the boom or operate the boom telescoping lever to the "RETRACT" (pull toward you) side to retract the boom to lower the boom.

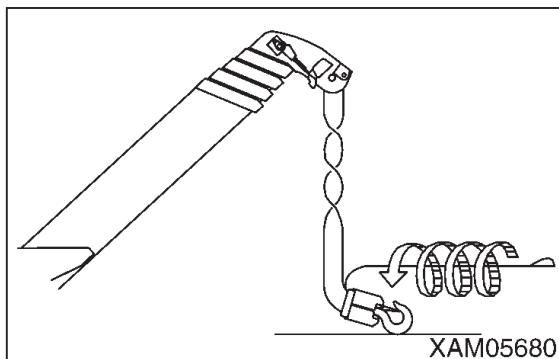
3. Turn the starter switch to the "OFF" position to stop the engine.



4. Remove the wedge socket pin securing bolt (1) to remove the wedge socket (2).



5. Force to twist the end of the wire for "n" (number of falls) times of the number hook is twisted for in the opposite direction from the direction the hook block is twisted to and which you checked in the step 1 (opposite direction from the one the wire rope tries to go back to naturally when you release your hand from the wedge socket) and install the wire rope.



6. Start the engine and operate the boom derrick lever to the "RAISE" (pull toward you) side to increase the boom angle to its maximum.

7. Operate the boom telescoping lever to the “EXTEND” (push forward) side to extend the boom to its maximum.
8. Operate the winch lever to repeat hoisting up/down the hook block for several times.
9. Tidily spool up the wire rope into the winch drum with some tension applied to the rope.
10. Repeat the above procedure until the hook is no more twisted.

If the wire rope is still twisted after performing the procedure above, change with a new wire rope.

6.21 WHAT TO DO WHEN THIS HAPPENS

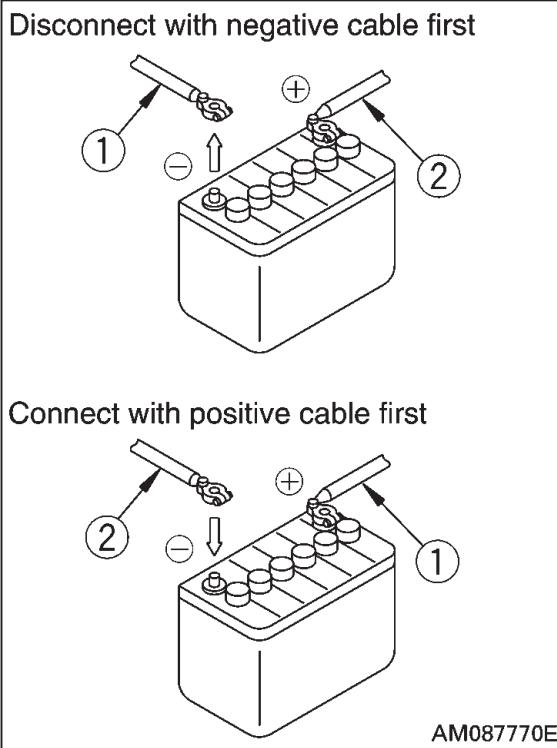
6.21.1 BATTERIES

Observe the followings when handling the battery.

⚠ WARNING

- Stop the engine and turn the main starter switch to the “OFF” position when checking/handling the battery.
- Wipe off the dust accumulated on the top of the battery with moistened cloth.
- The battery produces hydrogen gas, involving the explosion hazard. Do not put fire such as cigarettes close to the battery or take any actions that can cause sparks.
- The battery fluid is diluted sulfuric acid, which corrodes clothes and skin. Should the battery fluid come into contact with your clothes or skin, wash the affected area immediately with plenty of water. Should it go into your eye, wash your eye immediately with clean water and consult a physician.
- Wear goggles and rubber gloves when handling the battery.

- Disconnect the ground side (normally (-) terminal) first to remove the battery, and conversely, connect the (+) terminal first to install the battery.
- Objects such as tools coming between (+) terminal and the machine body will cause sparks.



- Slackened battery terminals can cause sparks with poor contact, involving explosion hazard. Tighten securely when installing the terminals.
- Secure the battery when changing the battery to prevent the battery from being displaced. If it is not secured, the terminals will slacken, causing sparks.
- Verify the (+) terminal and (-) terminal when removing and installing the battery.

6.21.1.1 CAUTIONS IN HANDLING BATTERY

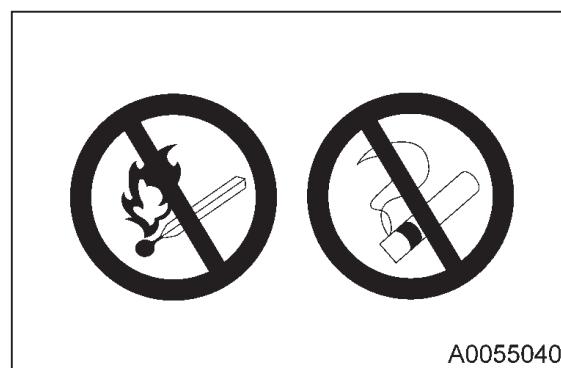
- The battery mounted on the machine is a maintenance-free battery. Because it is a sealed-type battery, the fluid does not need to be checked or replenished.

- Always try to keep the battery charged. The battery should not be charged in rush after being discharged. Charge the battery as needed. Keeping the battery in the best condition lengthens the life of the battery.
- The battery ability remarkably drops during the cold season. Keep the charging rate as close to as 100% and try to keep it warm for starting the operation next morning.

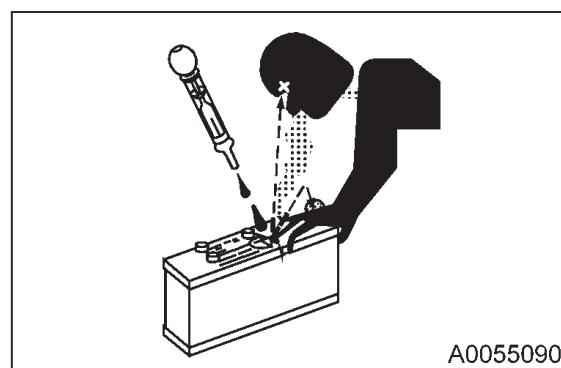
CAUTION IN HANDLING BATTERY

The battery fluid includes diluted sulfuric acid, and generates hydrogen gas, and causes bodily accidents and fires if handle improperly, so always observe the followings.

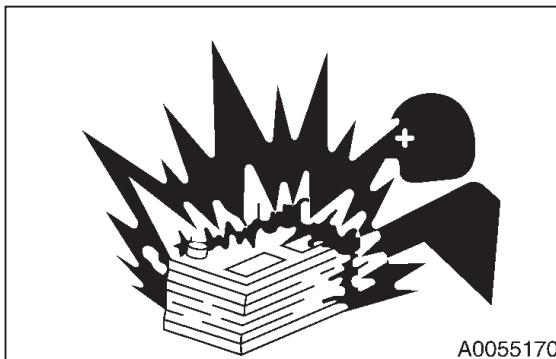
- Do not let a cigarette or any fire source approach the battery.



- Always put on protective glasses and rubber gloves before handling the battery.
- If the battery fluid contacted clothing or skin, immediately wash away by huge quantity of water.
- If the battery fluid entered an eye, wash immediately with water and see the doctor as soon as possible.



- If you have swallowed the battery fluid by mishap, immediately drink huge quantity of water, milk, raw egg or vegetable oil, and see the doctor as soon as possible.
- Wipe with a wet clean cloth when cleaning the battery upper surface or related part. Do not use organic solvent or detergent for instance gasoline or paint thinner.
- If the battery fluid is frozen, do not charge battery or start the engine using other power source. Such act may cause the battery to catch fire.



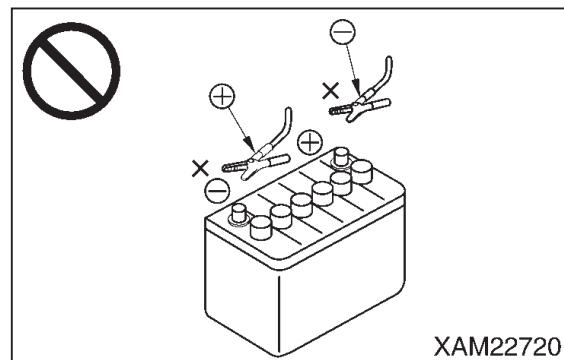
- Before charging or starting up using other power source, defreeze the battery fluid and check that failures such as battery fluid leak do not exist.
- Always detach the battery from the machine frame before charging the battery.

STARTING ENGINE WITH BOOSTER CABLE

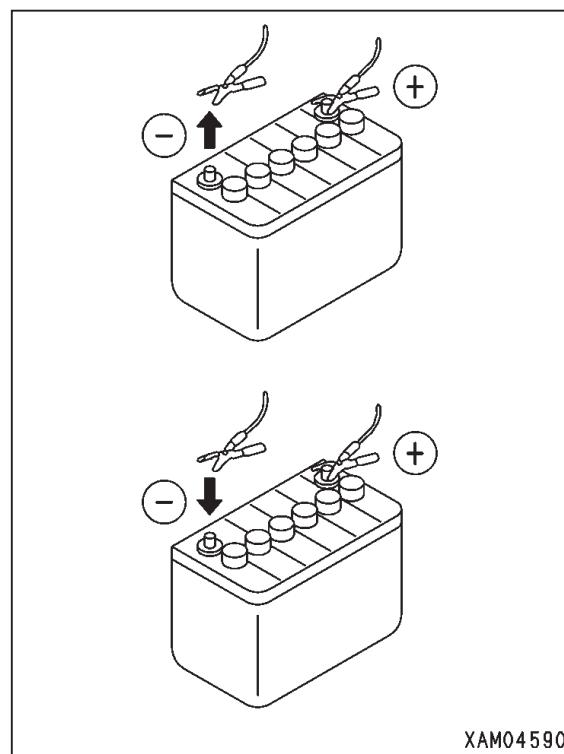
If the booster cable is connected incorrectly, it may cause a fire, so strictly follow the followings.

- Start the engine by two persons, with one standing on the operation position in the travel operation panel side.
- When starting using other machine, be careful to prevent contact between the normal machine and broken machine.
- Keep the starter switch key of both the normal machine and the broken machine in OFF position when the booster cable is connected.
- Do not connect to wrong side [connecting (+) to (-), (-) to (+)] when connecting the booster cable.

- Start connecting from (+) terminal first, but start disconnecting from (-) terminal (ground) first.

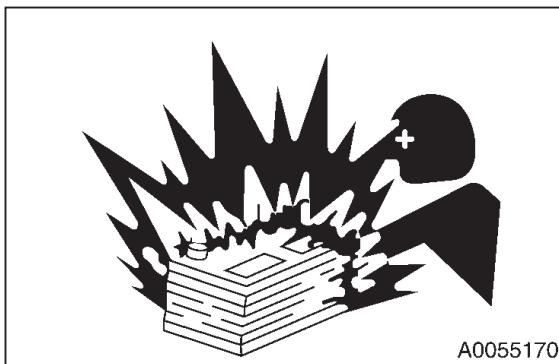


- Connect the ground to the (-) terminal of the battery of the broken machine when connecting the ground as the last procedure. For details, see "6.21.1.4 STARTING ENGINE WITH BOOSTER CABLE".
- When disconnecting the booster cable, avoid contact between the clips of the booster cable or between the clips and the machine.
- When disconnecting the booster cable, avoid contact between the clips of the booster cable or between the clips and the machine.



CAUTIONS ON CHARGING BATTERY

Improper handling when charging the battery may cause the battery to explode. Follow the manuals attached to the machine and the charger, and always observe the followings. See “6.21.1.3 CAUTIONS ON CHARGING BATTERY”.



- Adjust the charger voltage to suit the voltage of the battery to charge. Mistake in adjusting the voltage may cause explosions due to overheating and ignition of the charger.
- Securely fix the (+) charge clip of the charger to the (+) terminal of the battery, then securely fix the (-) charge clip to (-) terminal of the battery.
- Set the charge current to no more than 1/10 of the rated capacity of the battery.
- Do not use quick charging.
- Excessive charge current may cause leap fire and explosion caused by fluid leak or fluid deficiency.

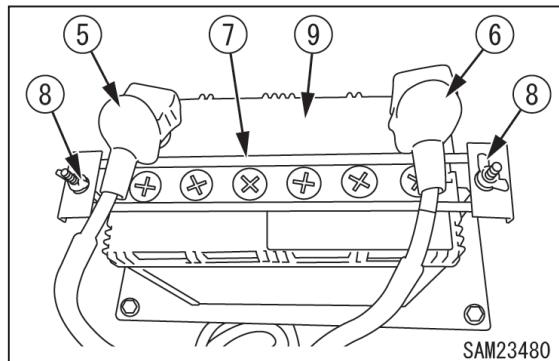
6.21.1.2 REMOVE / INSTALL BATTERY**⚠ CAUTION**

Verify that the battery does not move after securing the battery. If it moves, secure it again.

[1] REMOVAL

1. Remove the machinery cover as described in “4.2 REMOTE CONTROL SYSTEM.”

2. Disconnect the (-) terminal (5) on the ground side first and then the (+) terminal (6) to disconnect the battery cable.



3. Remove the wing nut (8), battery fixing brackets (7), and then remove the battery (9).
4. Reattach the machinery cover as described in “4.2 REMOTE CONTROL SYSTEM.”

[2] INSTALLATION

Reverse the removal procedure to install the battery.

- ☞ Connect the (-) terminal (5) on the ground side last when connecting the battery.

6.21.1.3 CAUTIONS ON CHARGING BATTERY

When charging the battery mounted to the machine:

- Abnormal voltage may be applied to the alternator, resulting in the breakage. Disconnect the battery terminal wires before charging the battery.
- Stop charging when the battery was overheated (fluid temperature exceeded 45 °C).
- Stop charging promptly once the charging is completed. Charging even after the charging is completed will;
 - (1) overheat the battery
 - (2) reduce the electrolyte level
 - (3) cause failures in battery

- Never inverse the connection of [(+) terminal and (-) terminal]. Doing so can cause damage on alternator.
- Remove the battery cable when handling the battery other than for battery electrolyte level check and specific gravity measurement.

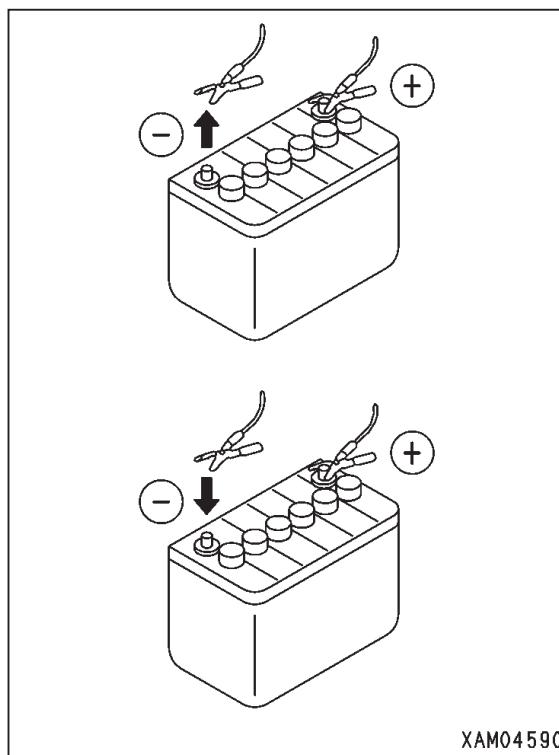
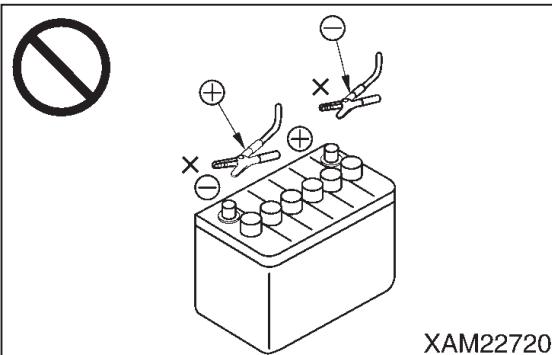
6.21.1.4 STARTING ENGINE WITH BOOSTER CABLE

Start the engine with booster cable as described below.

[1] CAUTIONS ON CONNECTING/ DISCONNECTING BOOSTER CABLE

⚠ WARNING

- Never let the (+) terminal and (-) terminal come into contact with the other when connecting the cable.



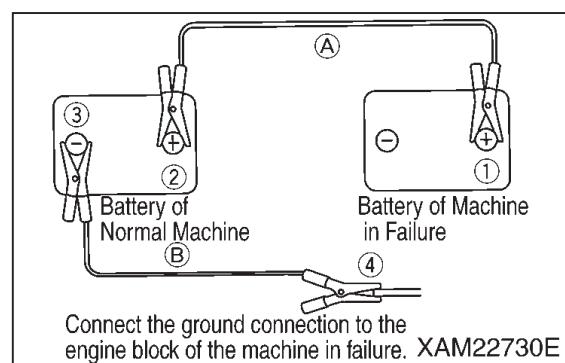
- Wear goggles and rubber gloves when starting the engine with the booster cable.
- Do not let the normal machine and machine in failure come into contact with the other. Because the battery produces hydrogen gas, sparks around the battery can cause explosion.
- Do not make mistakes in connecting the booster cable. Note that there will be some sparks when making the last connection. Make this connection at the location as far as possible from the battery.
- Do not let the booster cable clips contact the other or machine when disconnecting the booster cable.

⚠ CAUTION

- Use booster cable and clips of appropriate size for the battery size.
- The battery in the normal machine and machine in failure should be of the same capacity.
- Check that the cable and clips have no breakage and corrosion.
- Connect the clips securely.
- Verify that the operation levers are at the "Neutral" position.

[2] CONNECTING BOOSTER CABLE

Connect the booster cable in the numerical order shown in the figure.



1. Turn the starter switch of both of the normal machine and machine in failure to the “OFF” position.
2. Connect a clip of the booster cable (A) to the (+) terminal of the machine in failure.
3. Connect the other clip of the booster cable (A) to the (+) terminal of the normal machine.
4. Connect a clip of the booster cable (B) to the (-) terminal of the normal machine.
5. Connect the other clip of the booster cable (B) to the engine block of the machine in failure.

[3] STARTING ENGINE

⚠ CAUTION

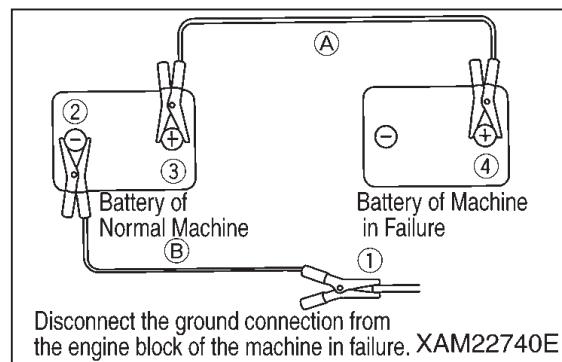
Verify that the operation levers are at the “Neutral” position. If the safety lock lever is equipped, also verify that the safety lock lever is at the lock position.

1. Verify that the clips are securely connected to the battery terminals.
2. Start the engine of the normal machine and increase the engine speed to full speed (highest speed).
3. Turn the starter switch of the machine in failure to the “START” position to start the engine.
If the engine does not start, wait for more than 2 minutes before re-starting.
☞ For more information on how to start the engine, see “5.2.2 STARTING ENGINE.”

[4] DISCONNECTING BOOSTER CABLE

When the engine started, disconnect the booster cable in the reverse order of connecting the booster cable.

1. Disconnect the clip of the booster cable (B) connected to the engine block of the machine in failure.



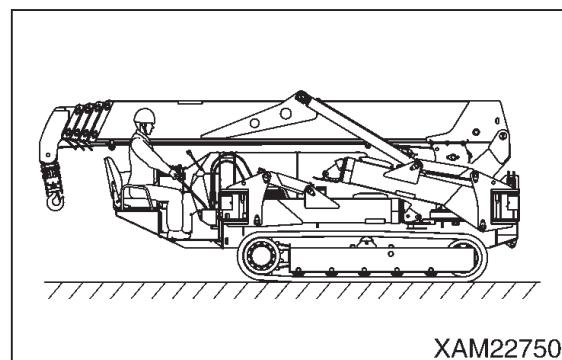
2. Disconnect the clip of the booster cable (B) connected to the (-) terminal of the normal machine.
3. Disconnect the clip of the booster cable (A) connected to the (+) terminal of the normal machine.
4. Disconnect the clip of the booster cable (A) connected to the (+) terminal of the machine in failure.

6.21.2 LONG-TERM STORAGE

6.21.2.1 BEFORE STORING MACHINE

⚠ CAUTION

The machine shall take the posture shown in the figure during the long-term storage to protect the cylinder rod. For more information on travelling posture, see “5.2.5 TRAVELLING POSTURE” (To prevent rust on the cylinder rod)



Store the machine as described below for long-term storage.

- Wash and clean each section of the machine and store indoor.
- If you absolutely have to leave it outdoor, select a flat location where the machine is not likely to be exposed to flood or other disasters and cover the machine.
- Refuel, grease, and change the oil without fail.
- Disconnect the negative terminal of the battery and cover, or dismount the battery from the machine for storage.
- If the temperature will go down to 0 degree or below, add antifreezing fluid. Ask us or our sales service agency for the mixing quantity of the antifreezing fluid.

6.21.2.2 DURING STORAGE

⚠ WARNING

If you have to perform antirust operation indoor, open the window and entrance for better ventilation to prevent gas poisoning.

Be sure to operate the machine once a month during the storage to maintain the oil film at lubricating section. Charge the battery at the same time.

6.21.2.3 AFTER STORAGE

⚠ WARNING

If you did not perform antirust operation monthly during the long-term storage, contact us or our sales service agency before using the machine.

Perform the followings before using the machine after the long-term storage.

- Refuel, grease, and change the oil without fail.
- Remove the cover over the battery (install the battery to the machine if dismounted for storage).

Check the electrolyte level and specific gravity, and then connect the battery cable from the positive side.

- Remove the drain plug of the fuel tank, hydraulic oil tank, and engine oil pan to drain the water mixed in.
- Carefully perform the check before starting operation and warm-up operation. Carefully check the various parts of the machine.

6.21.2.4 LONG TERM STORAGE FOR ELECTRIC MOTOR

IMPORTANT

- For details of long term storage, refer to “6.21.2 LONG-TERM STORAGE.”
- This section only describes long term storage methods that differ from those for standard vehicles.

Use the following procedure for storing the machine for 6 months or longer (3 months or longer if stored in hot and humid surroundings).

- Cover the electric motor and hydraulic pump of the power unit with a plastic sheet. Keep the machine dry with a dehumidifying agent in the covered sheet.
- Conduct 5-minute idling of engine quarterly during long-term storage.

IMPORTANT

- Quarterly insulation resistance test of electric motor wiring is required during long-term storage. Contact us or our sales service agency.
- Insulation resistance test of electric motor wiring is required before resuming the machine after long-term storage. Contact us or our sales service agency.

6.21.3 COLD WEATHER OPERATION

6.21.3.1 COLD TEMPERATURE PREPARATION

When the temperature goes down, the machine starts to have some difficulty in starting. Take the following actions.

[1] LUBRICATION

Change the oil to the one with low viscosity. For more information on the specified viscosity, see “6.6.1 USE OF FUEL AND LUBRICATING OIL ACCORDING TO TEMPERATURES.”

[2] COOLANT

⚠ WARNING

The antifreezing fluid is inflammable. Do not put the fluid close to fire and do not smoke while handling the fluid.

Do not smoke when handling the antifreezing fluid.

⚠ CAUTION

Never use antifreezing fluid with methanol, ethanol, and propanol.

For more information on the coolant replacement period and mixing rate of antifreezing fluid, see “6.18.11 [1] CHECK / REPLACE ENGINE COOLANT.”

[3] BATTERY

⚠ WARNING

- The battery produces combustible gas and can be explosive. Do not put fire close to the battery.**

- The battery fluid is a harmful substance. Keep it away from your eyes and skin. Should it come into contact with your eye or skin, wash the affected area with plenty of water and consult a physician immediately.**

The battery capacity drops when the temperature goes down.

In this condition, the battery fluid can freeze with low battery charging rate. Keep the charging rate as close to as 100%. Keep the battery warm in order to start the engine next morning.

[4] CAUTIONS AFTER COMPLETING THE OPERATION

Observe the followings to prevent the machine from not being able to function the next morning because of deposits such as dirt and water and materials around the feet frozen.

- Remove the dirt and water on the machine. Keep the hydraulic cylinder rod surface especially clean to prevent seal from being damaged with the dirt coming into the seal together with the water drops.
- Park the machine on the solid and dry ground. If there is no such location to park, place a board on the ground to park the machine on the board. This prevents the ground and around the feet of the machine from freezing and allows the machine to start travelling next morning.
- Remove the drain plug to drain the water in the fuel system to prevent the water from freezing.
- The battery ability remarkably drops at low temperature. Cover the battery or remove the battery from the machine and keep it at warm place to be installed next morning.

[5] AFTER THE COLD WEATHER IS GONE

When the season changed and it started to get warm, take the following action.

- See “6.6.1 USE OF FUEL AND LUBRICATING OIL ACCORDING TO TEMPERATURES” to change the oil in the system to the one with specified viscosity.

6.22 TROUBLESHOOTING

6.22.1 GENERAL

- Make sure that you contact us or our sales service agency for the actions indicated in parentheses in the Actions field.
- Contact our sales service agency if you suspect other abnormality or causes than those given below.

6.22.2 ELECTRICAL COMPONENTS

Problem	Major Cause(s)	Actions
Dark light even at highest engine speed	• Defective wiring	• (Check and repair slackened terminals and open circuits)
Light flashes during engine operation	• Defective alternator • Defective wiring	• (Replace) • (Check and repair)
Battery charge monitor remains lit up even after the engine starts	• Defective alternator • Defective wiring	• (Replace) • (Check and repair)
Abnormal noise from alternator	• Defective alternator	• (Replace)
Starter not rotating even after the starter switch is turned	• Defective wiring • Insufficient battery charge	• (Check and repair) • Charge the battery
Starter pinion going out and in repeatedly (struggling)	• Insufficient battery charge	• Charge the battery
Starter key turning slow	• Insufficient battery charge • Defective starter	• Charge the battery • (Replace)
Starter disengaged before the engine starts	• Defective wiring • Insufficient battery charge	• (Check and repair) • Charge the battery

6.22.2.1 MACHINE BODY

Problem	Major Cause(s)	Actions
Crane cannot operate but can travel	<ul style="list-style-type: none"> Work selector switch (travel/outrigger/crane) not at "Crane" 	<ul style="list-style-type: none"> Operate the work selector switch (travel/outrigger/crane) to "Crane"
<ul style="list-style-type: none"> Travelling speed, boom and hook block operation speed too slow Abnormal noise from pump 	<ul style="list-style-type: none"> Insufficient hydraulic oil Hydraulic oil tank strainer and element clogged 	<ul style="list-style-type: none"> See "6.12.1.2[5] CHECK / ADD HYDRAULIC OIL" and refill with hydraulic oil to the specified oil level Clean or replace the filter
Hydraulic oil temperature too high	<ul style="list-style-type: none"> Insufficient hydraulic oil Between cooling fins clogged 	<ul style="list-style-type: none"> See "6.12.1.2[5] CHECK / ADD HYDRAULIC OIL" and refill with hydraulic oil to the specified oil level Clean
<ul style="list-style-type: none"> Rubber tracks coming off Abnormal wear on the sprockets 	<ul style="list-style-type: none"> Rubber tracks too loose 	<ul style="list-style-type: none"> See "6.12.1.3[1] CHECK / ADJUST RUBBER TRACK TENSION" and adjust the tension
Outriggers cannot operate	<ul style="list-style-type: none"> Outrigger rotary not rotated to extension position (outward). Work selector switch (travel/outrigger/crane) not at "Outrigger" 	<ul style="list-style-type: none"> Secure the rotary at the extension position Operate the work selector switch (travel/outrigger/crane) to "Outrigger"
Crane and outriggers cannot operate	<ul style="list-style-type: none"> Work selector switch (travel/outrigger/crane) at "Travel" 	<ul style="list-style-type: none"> Operate the work selector switch (travel/outrigger/crane) to "Outrigger" or "Crane"

6.22.3 ENGINE

If the engine failure monitor is not lit or flashing, refer to the following for diagnosis.

Problem	Major Cause(s)	Actions
Engine does not start even after the starter key is turned	<ul style="list-style-type: none"> Insufficient fuel Insufficient battery charge Insufficient compression 	<p>See "6.12.1.2[3] CHECK / ADD FUEL" and refuel</p> <p>Charge the battery (Check and replace)</p>
Engine starts but stops right away	<ul style="list-style-type: none"> Insufficient oil in oil pan 	<ul style="list-style-type: none"> See "6.12.1.2[2] CHECK / ADD ENGINE OIL" and adjust oil level to appropriate one See causes and actions for "Engine does not start"
Engine power is low, the power gradually drops	<ul style="list-style-type: none"> Air cleaner element clogged Radiator fin clogged Insufficient compression 	<ul style="list-style-type: none"> See "6.18.13[4] INSPECT / CLEAN / REPLACE AIR CLEANER" and clean or replace the parts Clean (Check and replace)
Engine water temperature monitor lights up while the engine is in operation	<ul style="list-style-type: none"> Insufficient Coolant Water leakage from the cooling line Slackened or broken fan belt Radiator fin clogged 	<ul style="list-style-type: none"> See "6.12.1.2[1] CHECK / ADD ENGINE COOLANT" and refill with coolant (Check and repair) See "6.18.7[2] CHECK / ADJUST BELT TENSION" to check, adjust, or change the belt Check and clean
Engine oil pressure monitor lights up while the engine is in operation	<ul style="list-style-type: none"> Insufficient engine oil Engine oil filter clogged Engine unit in failure 	<p>See "6.12.1.2[2] CHECK / ADD ENGINE OIL" and adjust oil level to appropriate one.</p> <p>See "6.18.8[1] REPLACEMENT ENGINE OIL AND OIL FILTER" to check, adjust, or change the filter</p> <p>(Check and repair)</p>

If the engine failure monitor is lit or flashing, refer to the following to check the failure condition.

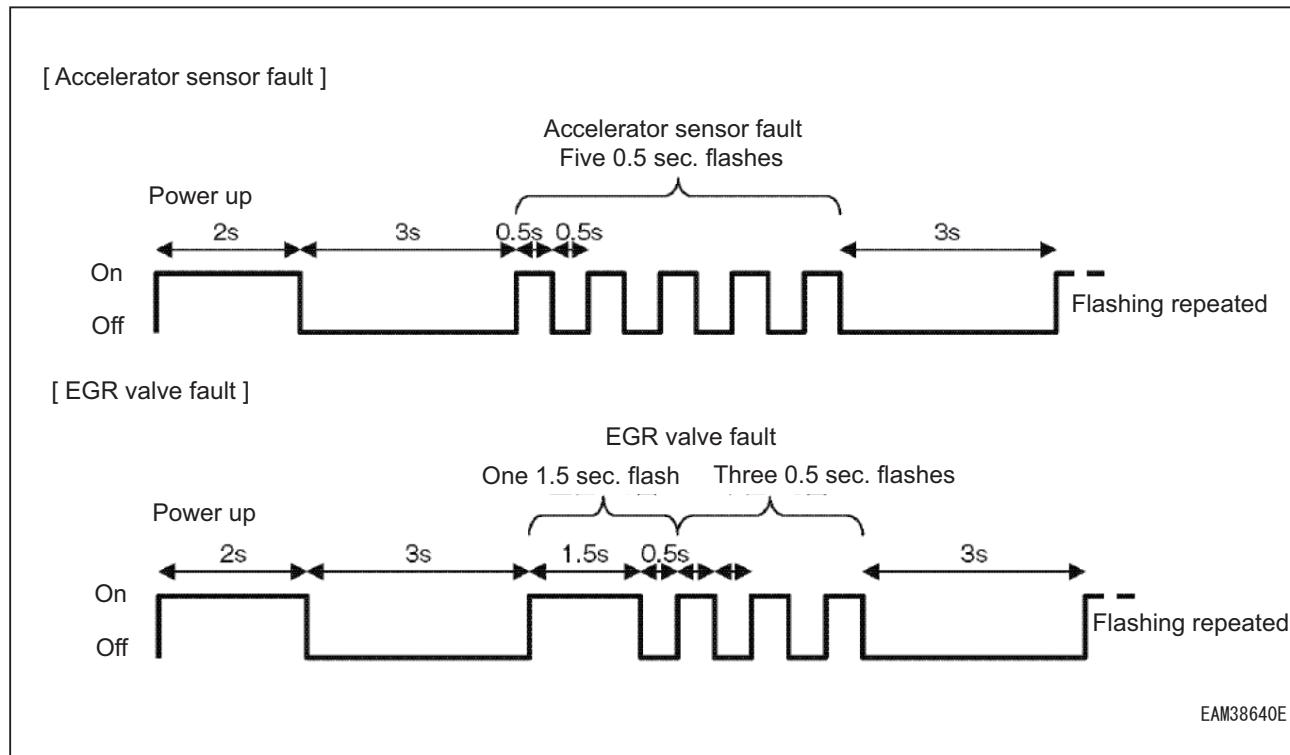
6.22.4 ENGINE FAILURE DETECTION

6.22.4.1 HOW TO READ THE ENGINE FAILURE MONITOR

Refer to the following for information on how to turn on and flash the engine failure monitor.

As an example of display, the following fault items are explained.

- Accelerator sensor fault
- EGR valve fault



If multiple faults occur at the same time, all faults are displayed in the order of the least number of flashes, and the lights and flashes are repeated in order thereafter.

6.22.5 ENGINE FAILURE DETECTION LIST

If an engine failure is detected, please contact us or our distributor.

No.	Fault (alarm) location	Engine status	No. of flashes/flashing pattern of engine failure monitor
1	Coolant temperature sensor		4
2	Accelerator sensor		5
3	Speed sensor	RPM limit or engine stop	6
4	Rack position sensor	Output and speed limit	7
5	Rack actuator	Engine stop	8
6	EGR valve	Output and speed limit	1-3
7	CSD solenoid valve		1-4
8	Starting aid relay		1-5
9	Main relay		1-6
10	Rack actuator relay	Engine stop	1-7
11	Oil pressure switch		2-1
12	Power supply voltage		2-3
13	ECU temperature (alarm)		2-5
14	Oil pressure		3-1
15	Battery charge (alarm)		3-2
16	Battery charging switch		2-2
17	Coolant temperature (alarm)		3-6
18	ECU-ROM	Engine stop	4-1
19	ECU-EEPROM		
20	ECU-sub CPU		
21	ECU-mapping format	Engine stop	
22	ECU-temperature sensor		

6.23 TROUBLESHOOTING FOR REMOTE CONTROL SYSTEM

Use the following procedures if the remote control system does not operate or partially operates, and if the crane operates normally using manual controls.

IMPORTANT

Perform the following checks first, before diagnosing error codes. Always first check if the problems are corrected by applying a different operation procedure or replacing batteries. If the failure is the result of electrical failure of the remote control system, the crane may still be operable under manual control.

Checks	Cause and Action
The crane is operable under the manual control from the crane.	When the crane operates, this remote control system has a failure. Otherwise, when the crane does not operate, perform the diagnosis of the crane itself.
The power to the transmitter is turned on when the Starter Switch on the machine main unit is ON.	If the power is not turned ON, turn it ON.
The Emergency stop (EMO)/Remote control power OFF switch is in the "ON" position.	Set Emergency stop (EMO)/Remote control power OFF switch on transmitter and the crane to the "OFF" position.
The transmitter is deformed or damaged.	Where the transmitter is deformed or damaged, repair or replace it.
Each operation lever of the transmitter is in its NEUTRAL position.	In the event of operation lever or control button failure, repair or replace.
The battery icon of the transmitter is flashing in red.	Replace the battery.

- Make sure that you contact us or our sales service agency for the actions marked within the table.
- Contact us or our sales service agency if you suspect any other abnormalities or causes than those given below.

Problem	Possible causes	Actions
Power is not supplied to transmitter after power-on.	Battery contact failure	Check battery for contact failure due to damage or dirt.
	Voltage is not applied to the transmitter.	Insert a fully charged battery.
		Charge battery.

Problem	Possible causes	Actions
Low voltage alarm goes off immediately after start of operation.	Battery contact failure	Check battery for contact failure due to damage or dirt.
	Battery is not fully charged.	Fully charge battery. Check if battery charging process is correct.
	Battery problem/service life expired	Check if transmitter functions correctly by using spare battery or fully charged battery.
Individual commands cannot be executed.	Receiver has failed.	Check receiver cable for disconnection.
	Connection to the machine is interrupted.	Check receiving status using receiver LED monitor.
	Controller has failed.	Inspect or replace controller on machine main unit.

6.24 TROUBLESHOOTING FOR ELECTRIC MOTOR

- Make sure that you contact us or our sales service agent for the actions marked with ★ in the table.
- Contact us or our sales service agency if you suspect any other abnormalities or causes than those given below.

Abnormal Phenomenon	Major Cause(s)	Actions
The motor remains off despite the switch being turned to the "START" position.	<ul style="list-style-type: none"> • Improper wiring and power supply error • The Inverter unit breakers: OFF • A break in stator winding 	<ul style="list-style-type: none"> • Check wiring, see "5.5.3 MACHINE OPERATION." • Turn ON the breakers. ★ Inspection, repair, replacement ★ Inspection, repair, replacement
The motor comes to a stop during use.	<ul style="list-style-type: none"> • Inverter unit error (Red lamp: ON) • Failure in the Inverter unit • Failure in the power unit 	<ul style="list-style-type: none"> • Check the power supply source (voltage and phase interruption). ★ Inspection, repair, replacement ★ Inspection, repair, replacement
The power output of the motor reaches zero or undergoes gradual decrease.	<ul style="list-style-type: none"> • Phase interruption in the power source of power supply equipment • Slack in motor wiring 	<ul style="list-style-type: none"> • Check the power source of power supply equipment (voltage and phase interruption). • Inspect connection with the motor Terminal block. ★ Inspection, repair, replacement
The cabtyre cable rises in temperature.	<ul style="list-style-type: none"> • Considerable voltage drop 	<ul style="list-style-type: none"> • Ensure that the power supply voltage of power supply equipment is at a specified value. • Replace the cabtyre cable with one adhering to specifications.
An abnormal noise and vibration are present in the power unit during operation.	<ul style="list-style-type: none"> • A break in motor winding • Looseness in the motor and pump fixing bolt • Looseness in the coupling fixing bolt • Impurities on the coupling • Clogging in the hydraulic oil tank strainer and element 	<ul style="list-style-type: none"> • Inspect the motor Terminal block. ★ Inspection, repair, replacement • Perform inspection, repair, and cleaning. See "5.5.3 MACHINE OPERATION." ★ replacement • Clean and replace the strainer and element according to periodic inspection.

The power unit rises in temperature during operation.	<ul style="list-style-type: none"> • High ambient temperature • Ill-ventilated • Considerable voltage drop • Overload • High number of starts 	<ul style="list-style-type: none"> • Use the power unit in environment compliant with specifications. • Perform inspection and cleaning. See “5.5.3 MACHINE OPERATION.” • Replace the cabtyre cable with one adhering to specifications. • Reduce loads. • Reduce the number of starts.
The leak detector of the Inverter unit main breaker is tripped.	<ul style="list-style-type: none"> • High humidity • Presence of water droplets • Ill-grounded • A break in stator winding 	<ul style="list-style-type: none"> • Use the leak detector in environment compliant with specifications. • Attach the cover properly. • Adhere to ground standards. <p>★ Inspection, repair, replacement</p>
The trouble lamp (red) of the Inverter unit comes on.	<ul style="list-style-type: none"> • Failure in the Inverter unit 	<p>★ Inspection, repair, replacement</p>

6.25 ERROR CODES

If any of the following error codes are displayed, refer to "Corrective action", and take corrective action. If the problem persists, contact us or our sales service agency for repairs.

If an error code is displayed, check the following table and take the appropriate corrective action.

Error code	Error details	Explanation	Corrective action
EC**	Controller error	A system error or communication error occurred in the controller.	Stop using the machine and contact us or our sales service agency.
EC03	TTC30X communication error		
EC20	Radio controller communication error		
EC50	Slope angle sensor communication error		
EC96	BMU communication error		
EC97	Motor controller communication error		
EC98	TTC60 communication error		
EC99	TTC540 communication error		
ES***	Sensor input error	A sensor-related input error occurred.	
ES02H	Derrick Pressure Sensor 1 (High voltage)	The input to pressure sensor 1 is higher than the specified value.	
ES02L	Derrick Pressure Sensor 1 (Low voltage)	The input to pressure sensor 1 is lower than the specified value.	
ES03H	Derrick Pressure Sensor 2 (High voltage)	The input to pressure sensor 2 is higher than the specified value.	
ES03L	Derrick Pressure Sensor 2 (Low voltage)	The input to pressure sensor 2 is lower than the specified value.	

Error code	Error details	Explanation	Corrective action
ES04H	Boom Length Sensor (High Voltage)	The input to length detector is higher than the specified value.	Stop using the machine and contact us or our sales service agency.
ES04L	Boom Length Sensor (Low Voltage)	The input to length detector is lower than the specified value.	
ES05H	Boom Angle Sensor (High Voltage)	The input to angle detector is higher than the specified value.	
ES05L	Boom Angle Sensor (Low Voltage)	The input to angle detector is lower than the specified value.	
EO***	Output error	An output error occurred.	
EOC***	Output error	An output error occurred.	
EH01	Hydraulic oil temperature error	The hydraulic oil temperature was above 95°C continuously.	Run the engine at idle for a while without shutting down the engine.
EV01	Battery Voltage Abnormality	Battery voltage below 11 V continuously.	<ul style="list-style-type: none"> Check battery voltage. Check cables. Recharge/replace battery.
All other codes ***_*	Engine	An engine-related error occurred.	<p>If the codes listed above appear simultaneously, corrective action for those codes should take priority.</p> <p>If only the engine error code is displayed, stop using the machine and contact us or our sales service agency.</p>

- The numbers indicated by *** in the error code will vary depending on the individual error.

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